RAILWAY ENGINEERING AND MAINTENANCE OF WAY

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A Railway Journal

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Communications on any topic suitable to our columns are solicited.

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TO OUR READERS.

Someone has wisely said, paradoxical though it may seem, that *"Nothing is constant but change."* The history of everything is only a series of changes. From the beginning of the universe changes have been constantly taking place, and, as we all know, each period in geology has outdone its predecessor in advancement, resulting finally in the introduction of the human race, which has brought about change after change, until we now enjoy an era of wonders—inventions—and a condition of progress and universal prosperity.

Following the rule thus laid down, this issue of RAILWAY ENGINEERING AND MAINTENANCE OF WAY appears under new management and is sent forth from a new home and new surroundings, with the hope of its owners and those engaged in its production that this change, too, will be for the better.

The periodical was born and brought up in Chicago, and by reason of this has been educated to a standard of general usefulness, and on lines of present-day progress. It is with no disparagement, therefore, to its past that we hope to improve its standing in the world; but rather with the notion that every change makes for the better, on general principles.

Established in 1884, RAILWAY ENGINEERING all these years has aimed to satisfy a demand for information and further education in a field which to-day is one of the most important branches of the railroad business. It has found its way into every railroad office in the land. It has stood for honesty of purpose, and on the side of the railroads and their employes in their more than strenuous efforts to serve the great American public, and it will hold to this policy in the future.

RAILWAY ENGINEERING will also continue to wear its old dress; but, like the man of prominence in affairs who was once criticized for his lack of style, it can well say, "Everybody knows *me*, and I occupy a position where I can at least dress as I please."

RAILWAY ENGINEERING has pleasantly fallen into the hands of the Railway Periodicals Company, a New York corporation, and from its New York headquarters, with a new editorial staff and new executives, will continue, with an extra effort, to meet the requirements of its readers.

It invites patronage; it will be pleased to consider every suggestion which its patrons may offer looking toward its improvement, and will deal with such current events in the railroad world as will especially interest those who are in the habit of turning its pages.

Ernest C. Brown is president of the Railway Periodicals Co., Inc. which owns and has assumed the direction of RAILWAY ENGINEERING AND MAINTENANCE OF WAY, the *Railway Master Mechanic*, periodicals, as well as the *Monthly Official Railway List*.

The office of publication has been removed from Chicago to Vanderbilt Concourse Building, 52 Vanderbilt Avenue, at East 45th Street, nineteenth floor, New York. The transfer of ownership is so recent that little opportunity has been allowed to gather all the talent necessary to produce a publication fully up to the ambition or intentions of its owners, but that will come in due season.

Mr. Brown is a successful publisher of over a quarter of a century's experience in directing the affairs of technical publications. He owns a large majority of the shares of the Railway Periodicals Company, and has acquired these publications as an investment, acting on the belief that the railway interests of the country are on the threshhold of greatly improved conditions, which these periodicals, in their sphere, can aid by stimulating and putting them forward. A staff, to which other trained hands and minds will be added as the trend of affairs requires, has been brought together.

The brief resumé of the careers of some of the gentlemen already connected with these periodicals will indicate our intention to publish timely, useful and practical matter, which we feel safe in saying will prove of increasing worth to our readers, whose active co-operation and friendly encouragement is most earnestly sought.

S. A. Bates, the Secretary and Treasurer of the new

company, has been connected with the publishing business in an executive capacity for about five years. His experience in the active administration of large interests covers more than twenty-five years. His knowledge of business development will enable him to handle the affairs of the company which will be in his charge so that our patrons will obtain service and satisfaction.

Charles Samuel Myers, vice-president and business manager of the new company, has long been associated with these publications. He began his career in the business department of the Chicago *Daily Mail,* where he handled railway and financial subjects. In 1899 he became associated with the RAILWAY ENGINEERING AND MAINTENANCE OF WAY, *Railway Master Mechanic,* and *The Monthly Official Railway List,* in the business department. Since that time he has been actively engaged in furthering these various interests. Mr. Myers has been the mainstay of the publications during the recent period of reorganization and now throws himself into the work before him with renewed enthusiasm.

Benjamin Norton, editor-in-chief, is a graduate of Williams College. After studying law and being admitted to the bar of New York State, he took up railroad business as a profession, beginning at the bottom, on the Manhattan Beach Railway in its early days. Later he filled a position as clerk in the local freight office at Indianapolis of the I., B. & W. Railway, now the P. & E. division of the "Big Four." Afterward he came to the Long Island, occupying various positions, until he was made purchasing agent and paymaster of the road. He became assistant superintendent following this, and for five years, later on, was vice-president and general manager.

He was elected president and General manager of the Atlantic Avenue system of electric lines, in Brooklyn, following his services on the Long Island, and remained in that position until the system was absorbed by the Brooklyn Rapid Transit Co. He built and operated the Orange County, N. Y., traction lines; was afterward general manager of the Ohio Southern, representing the first mortgage bondholders, to whom the road fell after a long receivership. He was finally elected president and general manager of the Toledo, St. Louis & Western, known generally as the "Clover Leaf." There he remained for about five years, or until other interests came into control. Since then Mr. Norton has been engaged in the examination of railroads for various banking interests, and has found time to indulge in literary work in a general way. His long experience, covering more than twenty-five years of active and practical railroad work, is a guarantee of his familiarity with the needs of this periodical.

George Sherwood Hodgins, A.S.M.E., takes the position of managing editor of the publications. He is not unknown in the field of technical journalism. Mr. Hodgins was born in Canada, and received his technical education at the School of Practical Science in affiliation with the University of Toronto. Leaving the educational institution and passing through the apprentice stage in a locomotive building establishment, he began practical railway work in a division master mechanic's office on the Canadian Pacific Railway. On that road he held a number of positions as advancement came, and had become locomotive inspector for the entire system when another position opened for him—as mechanical engineer of the locomotive works in which he had served his apprenticeship.

When hard times came to that concern, he took service with the Pressed Steel Car Co., of Pittsburgh, and had the inspection of the output of that important and extensive plant placed in his hands. While in Pittsburgh, a New York railroad publication, to which he had been an occasional contributor, secured his services as editor. He has been a close student of railway problems, both mechanical and economic, and has also contributed in his spare time to the pages of popular science magazines.

He has thus had a wide and practical railroad experience and has done editorial work in New York for eight or ten years. Two years ago he was called upon by the Canadian government, as an outsider, yet familiar with Canadian conditions, to make a comprehensive report on the shops, appliances, tools and equipment of the National Transcontinental Railway, before final negotiations were entered into with the Grand Trunk Pacific Railway. Having completed that work, Mr. Hodgins has now joined the staff of RAILWAY ENGINEERING.

Laurence A. Horswell, after his technical training in the University of Wisconsin, has for four years been writing for railroad men on their own and railroad supply subjects. He has been engaged in a number of practical investigations where the applicability and utility of railways appliances were undergoing the service test. After this experience he became associate editor of RAILWAY ENGINEERING AND MAINTENANCE OF WAY, and also the *Railway Master Mechanic,* and with his camera has been visiting a number of railroad shops gathering editorial material. This and similar work from his pen will appear in the columns of the periodicals, and in his investigations along these lines we bespeak for Mr. Horswell a cordial reception from those with whom he will come in contact and those whose interests we desire to serve.

THE PEOPLE, THE RAILROADS AND THE LAW

The public service commissions—both state and national—surrounded and guided by law and accompanied always by the moral support of the public, have finally secured a hold on the railroads of the country, which practically amounts to control without in any wise calling for an assumption of the railroads' debts by the government or creating any responsibility, on its part, on account of any of their obligations whatsoever.

The old talk of government control meant the actual purchase of the railway shares, in order to secure such control. It was fortunate for the people that this never occurred, for we know what government control of that sort means. In its endeavor to take care of its investment and operate the railroads, the government would have drifted into hopeless bankruptcy; the people would

have become entangled in their own net, as it were, and would have fumed and fretted over the burden placed upon them, from which there would have been no escape.

Were the railroad managements at fault in the first instance, for bringing into vogue the commissions now existing, and were they primarily responsible for the drastic laws, under which the railroads are now operated?

Would violent action, if we may so call it, have been taken by the law makers, if there had been no good reasons for it? We are forced to answer yes to the first question and no to the second. Allowing that the commissions were properly introduced, as a wedge between the public and the railroads, may we not further ask, have the commissions been altogether reasonable in their actions since they were so instituted? We can unhesitatingly and positively answer no to this question.

As soon as the locomotive appeared and the railroad was introduced, they became at once the great civilizers of mankind; opening to development every quarter of the globe and uniting one section of a country with another, until now, in the United States particularly, the ramifications and intermingling of railroad systems as presented on the maps, look like a hopeless tangle of threads and worsteds.

In the beginning, budding towns, especially in the West, invited projected railroads to come to them, and go through them and aided, in various ways, to bring this about, offering rights of way—even through public streets—and furnishing sites, free, for station buildings and other structures. They appreciated the importance of a railroad connection and worked strenuously to secure it. The projectors of the railroads, on their part, boldly raised the necessary funds and assumed risks and responsibilities almost beyond measure, and succeeded. The great railroad systems of to-day are lasting monuments to the pioneers in this field who risked everything in their efforts which civilized the country. For these great risks and this enterprising spirit they were entitled to a rich reward and the people did not, then, begrudge them this return.

As time went on and the country grew, railroad facilities were still grossly inadequate. Other lines were built and extensions added until the risks involved on the part of the promoters began to grow less. It was only necessary to build a line through some undeveloped region, when business came, forthwith. The railroads had no difficulty in meeting their obligations and in many instances, paying dividends. Rates for doing business were comparatively high and prosperity naturally followed. Then it was that a spirit of independence on the part of the railroad managements developed. The public and the railroads now and then crossed swords. Where gratitude once existed, an ungrateful spirit toward the later day railroad managements arose, until such declarations as *"the public be damned"* and *"what are you going to do about it?"* coming from the railroad men, inspired a further feeling of distrust and discontent. This was quite natural. It was human nature for the people to feel hurt. They had profited to be sure, and so had the railroads. Then arose the question—who caused this great prosperity, anyway—we people or you railroads?

A calm view of the matter requires us to admit that the railroads were the prime cause of the upbuilding of the country and brought about the great money-making epochs which followed their construction. It needs no lengthy argument to prove this.

Prior to the introduction of the commission, the man with a grievance might, in the course of his endeavor to finds satisfaction, reach the president's office. That was the court of appeal; the court of *last resort*. Failing there, he either had to pocket his grievance and fume with indignation or engage legal talent, at large expense and trouble. Here, then appeared a demand for an intermediary between the people and the railroads, to determine every day disputes. After much discussion and lawmaking this intermediary—the public service commission—was established. Since then laws, regulations and restrictions have been put in force, from time to time, so that, to-day, as if in a spirit of deep revenge, having, by law, an upper hand, the great public and the commissions seem to be engaged on a line of action which treats the railroads as menaces to public welfare. Wherever an opportunity presents itself they are grinding their heels into these magnificent enterprises—without which this great country would still be an unexplored waste.

Instead of placing impartial arbiters on the bench of this logical institution—the public service commission—men of experience in affairs, with an occasional railroad man of high standing intermingled, it has seemed wise to appoint men without such experience who do not hesitate to declare themselves against the railroads on general principles, who feel that they have been selected to take the people's side, always; to regard the railroads as wrong, first, last and all the time. This, of course, has resulted in gross injustice. The country and the railroads are both suffering now because of this open hostility, as shown by the radical reductions in rates in some cases and a refusal to grant reasonable rate increases in others, as well as other relief.

We are not discussing the question of finances, the issuance of securities nor the evils that have come about from an unfortunate excess in this regard, in several recent instances. We are presenting the case from the standpoint of the railroad as an institution which has brought about marvelous results the world over; that indispensable highway leading to great advancement and unparalleled prosperity. Granted that the railroad is a purely public institution; founded on special acts of law and operated for the benefit of the people; yet, in spite of this the raidroad has some rights, some claim to fairness, as an individual. Holders of railroad securities are legion. The people's money is tied up in railroad bonds and other railroad obligations and the people in consequence are at present embarrassed by the many unjust regulations under which their properties are compelled to operate. They will continue to be embarrassed just so long as they inconsistently encourage any move looking toward further oppression of the railroads.

There is some evidence of an awakening just now. An insistent public and the lawmakers seem to be slowly growing wise to the fact that gross injustice has prevailed, and this long enough, too, to set some of our railroad companies back into painful embarrassments.

But why be slow about fairly adjusting these affairs? Why continue further on the supposition that the railroad is a public menace instead of a permanent good? The punishment for a once-supposed arrogant disposition has been more than enough to cover the offense. Like the generous victor in battle, let the people and the commissions now exercise a real spirit of magnanimity, by withdrawing this apparently vindictive pressure.

A great opening appears in the cloud of financial distress which has hovered over affairs generally, for the past several long years. Great aid to the betterment of conditions will be secured when the railroads, unhampered by extreme and injudicious exactions, are allowed like peaceful citizens, to go on their way in pursuit of happiness.

INCLINING THE RAILS

In examining the Lundie tie-plate, a description of which appears in another column of this issue, it is readily apparent that the inclination of the rail is practically involved. Several interesting questions at once come up in this connection, and we invite any of our readers who have anything to say on the subject to write us now.

European practice makes the inclined rail a standard method of procedure. In this our friends who favor the inclined rail see a method that they think we might copy with advantage. The coning of the wheel in Great Britain and on the continent is practically 1 in 20 and the rail is so placed as to have the surface of the head normal to the coned tread, thus reducing the leverage tending to bend the axle.

Before considering the matter further it is well to have a clear understanding as to why the wheel tread is coned at all. The answer usually given when a question on the subject is asked is to say that the coning of the wheel tread reduces flange wear and saves the rail. This is true as far as it goes, but the fuller explanation involves the fact that with properly coned wheels and a straight track, the coning of the tread, theoretically, allows the truck to run along the track without any flange on the wheels. The flange is thus, by this view, a safety device, occasionally called into action on straight track and nearly always on curves, but the bulk of the work of guiding the wheels is performed by the coned tread.

On a straight track, suppose each wheel stands, with tread circumference equal, and as the car proceeds any tendency to roll off the equal circumference line is automatically checked because if the right wheel presents a larger circumference to the rail the left wheel necessarily presents less than it did. In other words, the right wheel becomes, for the moment, larger than the left, and the wheels at once begin to roll off the right rail and approach the left, and when the left wheel becomes the larger it tends to roll off the left rail and toward the right again.

The coned wheels are forever trying to adjust their circumferences, and the result is a slow, gentle, swaying of the vehicle first toward one rail and then toward the other, and where the track is good the flange may not be called into play. On curves the larger circumference of the outer wheel, where the tread joins the flange, acts in conformity with the greater length of the outer rail, and the flange and throat complete the work of guiding so that the car stays on the rails.

This is the good office performed by the coning on the wheel tread, and it takes place without reference to how the rail stands and is indifferent to the shape of the head. It is entirely a wheel function. The M. C. B. standard wheel tread is coned 1 in 20, similar to that of European practice. At the June, 1915, convention of the M. C. B. Association a suggestion was made to alter this coning to 1 in 40. The answer of the Committee on Wheels was: "A communication has been received from one of the roads, a member of this Association, criticizing the present standard taper of tread of 1 in 20, and recommending that change be made to 1 in 38, the claim being made that the present standard taper is responsible for increased rail renewal, and is also more severe on the wheel itself. It is the opinion of your committee as a whole that any reduction in the taper of the tread will be detrimental to the wheel, but that if it can be shown that such change would be of sufficient benefit to the rail as to offset any bad effect on the wheel, they would be willing to consider such change."

This is the opinion of a responsible committee which has studied the question and speak with authority. We have here glanced at the good effects of tread coning and have observed that the credit belongs to the wheel. We may, however, state the belief of many, that the inclined rail offers a sort of co-operative benefit to the action of the wheel, while protecting itself. In the nature of the case the relative position of wheel and journal is not, and cannot be, theoretically desirable. The weight acting downward on the brass is carried to the wheel, and the support of the rail is not in line with that through the center of the journal. A certain tendency, therefore, is always present, and its action in extreme cases would be to bend the axle. The power of this tendency is measured by the distance between a vertical line through the center of the load on the journal and the tread resting on the rail. Any reduction of this distance must necessarily reduce the tendency to bend the axle, and is therefore not only beneficial, but strictly scientific.

When the rail is inclined inward so that the head more nearly conforms to the coning of the tread, this distance is lessened and the wheel stands with better bearing on the rail. Its inclined position places the rail so that it can better resist the wedging action of coned tread on the nearly flat head of the rail. This wedging action tends to overturn the rail or cause it to "roll out." The inclined rail and the coned tread with their improved bearing surface places the load on the rail in the position where the rail can best exercise its function as a steel beam and where it will bring the wear more to the center of the rail and reduce flange wear. This position reduces the tendency to bend axles and by confining the wear to a particular zone reduces flange rubbing, and thus prolongs the life of the wheel.

The effect of coned wheel and inclined rail, as we have seen, saves the wheel from a certain amount of flange rubbing, and the rail benefits from the same cause. The friends of the inclined rail hold that by thus removing rail wear from one edge to the center the danger of broken rails due to the formation of transverse fissures is greatly reduced. In other words, the rail is believed to be free from the chance of splitting, and the pressure on the base of the rail is more correctly and evenly distributed when the base is normal to, or in line with, the load put upon it by the wheel.

It is further claimed by advocates of the view that the inclined position of the rail is more scientific than the vertically placed rail, that old rails and worn wheels would benefit if the change was made. The zone of wear would be shifted, and a new rail surface would come into use which had not been touched previously. The effect on the wheel would be somewhat similar, but during the process of wearing in the new position the wheel would have a decreased axle bending tendency, for the reason that the leverage between the center of the journal and the point of support on the rail would be actually lessened.

This whole question is well worthy of the most careful consideration. The inclined rail position is backed up by the force of enlightened European practice, and while many of their methods would not suit American conditions, this one, that of the inclined rail, does not seem to be among the number. We would be glad to hear from any of our readers who is in a position to express an opinion and to help forward the discussion. Whatever may be the outcome, and we do not presume to prophesy, it is reasonably certain that the question will eventually be discussed by the M. C. B. Association, the American Railway Engineering Association and the American Railway Association, and probably by a joint committee. Our readers now have the floor.

HIGHWAY CROSSINGS

Automobiles and good roads have brought about a condition which, today, on account of the pressing demands for safety, forces upon the railroads and the communities through which they run, expenditures involving millions.

This matter of highway crossings is, therefore, one of vital consequence.

Circumstances in many cases exist which are practically prohibitory against either an under or an overhead crossing and the engineering departments of both railroads and cities are now puzzling over the problems presented. The subject is taxing human ingenuity to its utmost, both from an engineering as well as a financial standpoint. It is so important that we feel it will interest our readers to the point of furnishing us with such information as they may have at their command, with a view to disseminating their knowledge and experiences not only for the benefit of the public in general but the railroad companies as well.

With this in view, we intend to propound a few written questions soon, to which we invite replies which will be published from month to month. Many of the railroads have already gone to great expense in this direction especially in congested districts and are still expending large sums to eliminate the often fatal grade crossings which are such a source of anxiety and care everywhere. The railroads and the public are united in their efforts to provide absolute safety in this regard, if it is possible.

In line with our subject it might be of interest to observe that on the Long Island road highway crossings are not only very frequent, but the traffic across the line at some points is tremendous, so much so that to avoid accidents more than extraordinary efforts have to be employed. Under orders from the General Manager a special count taken of the traffic across its tracks on a recent Sunday showed that 9,408 automobiles used the Merrick Road crossing and 4,739 motors used the Barnum Island crossing on the Long Beach division. This count covered a period of 24 hours. Between 12 noon and one o'clock on that day 845 motor cars passed over the Merrick Road crossing, or at the rate of one car every *four seconds*. With such conditions in mind it is easy to see what dangers grade crossing are likely to invite. While it is incumbent upon the railroads to meet the situation a responsibility is likewise cast upon the drivers of vehicles who can assist by using extraordinary care, too, until such time as over or under grade crossings are provided. The Long Island Road has done a great work looking toward safety in this direction and is still engaged over the problem where over or under grade provision can be and ought to be made.

Trusting that the method we propose will meet with your approval, we beg for all the information possible. Anything that may be suggested on the subject, outside of our own questions, will be most acceptable.

RAILWAY SUPPLIES

Probably no subject has been harped upon more frequently than that of railway supplies and the methods employed concerning the receipts and distribution of them. Of late years the railroad supply department has received more close and careful attention than it formerly did, so much so that the receipt and distribution of material is now regulated, on some roads, as it should be, very much in the same way that provident merchants employ in *their* business; for upon careful consideration in this direction the profit and loss account largely depends. Whether one earns a profit at the end of the year or finds himself hopelessly involved will depend upon the care he exercises in his purchases and the distribution of them. Next to the purchasing agent, who fills the requisitions, stands the general storekeeper, who sends the requisitions in, receives the materials, has them under his supervision and delivers them to the various departments as needed on properly approved orders.

The receipt and distribution of supplies can be carefully accounted for, by him, under a suitable method of bookkeeping and stock ledgers. He is thereby able, when he takes his inventory, now and then, to determine exactly for what accounts and purposes he has passed the supplies out and exactly what he has on hand, allowing for reasonable deductions on account of wastage and loss.

In their anxiety sometimes to finish work without delay or be in position possibly to go on with more work on short notice, department heads in sending in requisitions are very apt to call for more than they may actually need, hence an accumulation oftentimes of material which may become obsolete or be on hand in such quantities that it will remain in store indefinitely. We thus see that much capital may be unnecessarily tied up which finally results in further loss when these supplies are disposed of as old material, at much less than their cost. The matter generally involves good judgment both on the part of the department heads as well as the storekeeper. In his desire to make a good showing the storekeeper is apt at times to cut down requisitions, when by so doing he may not only delay important work, but be required finally to send in for the balance of the material at a time when it may not be possible to have it delivered promptly.

Instances of both excess and minuteness are common, as everyone knows who has had practical experience in this matter of railway supplies. Laughable instances in both directions might readily be cited. If two cylinders are absolutely required in the repair of an engine, it would be ridiculous for the storekeeper to snug his requisition down to one. Yet such a case as this and similar ones are in mind. Cases of excess are too common to mention.

The purchasing agent comes in contact directly with the supply dealers, and it is his duty to buy at the lowest possible prices consistent with first-class material. "Safety first" applies to him as much as to anyone else on the line, and it should be his motto constantly. Coming in contact with the clever salesman, as he does, every day, he must be alive not only to his keenness, but he familiar with the various kinds of supplies—which are legion—as well as the prices. Even a clever supply house representative may "fall down," as the saying is.

When an oil man, in the old days, was asked by a purchasing agent on one occasion if the oil he was selling "gummed," he promptly replied "Indeed it does; and it gums beautifully."

Every reputable concern in business should be invited as far as possible to quote prices and have a fair chance to sell its wares to the railroad, prices, quality and delivery considered. Many concerns deal in specialties, as we know; and there are many instances where imitations and claims for equality cannot be entertained. The best and only the best for the purpose is what the road wants and must have, and at the very lowest market prices.

The disposition of old material, usually under the supervision of the purchasing agent or his representative, requires as much skill as the purchase of the new. Here, too, the market must be constantly consulted, and scrap of all kinds sold to the highest bidder. Scrap accumulates rapidly, and should be sold every month, as we

know. It assists to keep the yards clean and turns into the treasury handsome sums which can be applied toward buying new requirements.

Some years ago, during the examination of a railroad property, the supply department reported that there was practically no old material on hand; that it had all been disposed of. Further investigation revealed $200,000 worth of scrap iron, 6,000 old car wheels, and odds and ends enough of saleable material to make up an account of more than $250,000. No small sum, which could be used to meet requirements in many directions. This was a case where inefficiency played an important part.

No. 1. Care in making requisitions and in buying materials;

No. 2. Care in receiving materials;

No. 3. Care in distributing materials.

No. 4. Care in disposing of the old material,

sum up this subject.

This can all be accomplished by a suitable method of requisition and inviting bids; stock ledgers to record the receipts; proper books of account and frequent inventories of material on hand, and finally a judicious sale of the old or obsolete material.

THE AUTOCLAVE TEST FOR CEMENT

By A. M. Wolf.

In the August, 1912, issue of this magazine comment was made on the Force Autoclave test for cement which had just been adopted as one of the requirements of the specifications for cement purchased by the D. L. & W. R. R. These specifications were printed in RAILWAY ENGINEERING AND MAINTENANCE OF WAY of March, 1913. Since that time the United States Government has made an investigation into the value of the high pressure steam test (Autoclave Test) for Portland cement, a summary of the results of which were given in the June, 1915, issue of this magazine.

The Autoclave test has during the past three years, since its adoption by the D. L. & W. R. R., been the subject of much discussion and several attempts have been made to have it incorporated in the standard cement specifications of the American Society for Testing Materials and in the government specifications. This led to the investigation of the value of the test by the government. The conclusions drawn from this investigation are of such a nature as to discredit the worth of the Autoclave test for cement used in ordinary structures.

Many of the cement manufacturers objected to the test for the simple reason that their product would not pass the test, the objection being quite natural. Other mills adopted the test and are still using it.

The conclusions drawn from the U. S. Bureau of Standards' investigation are not quite clear. The first two conclusions are, first, that the test should be used on all cement entering into the manufacture of concrete products cured under steam pressure, and second, that it may be of value as forecasting the behavior of neat cement or a very rich mortar, but that it does not forecast the behavior of cement in concrete as normally used.

The question here arises, are tests covering a period of only two years extensive enough or long enough to warrant the deduction made, especially as regards concrete? Neat cement or cement mortar will develop unsoundness much quicker than concrete, and this no doubt is the reason for the opinion that the high-pressure steam test is of value as a forecaster of the behavior of cement. Unsoundness in cement incorporated in concrete requires some time to develop, due to the comparative isolation of the inert cement particles in the concrete. It is only the combined disruptive action of many of these inert particles within a small area which causes disintegration. Short time tests are not conclusive as to whether cement which will not pass the high-pressure steam test will develop unsoundness or not. Unsound cement may not exhibit its destructive properties as quickly or as forcibly in the latter as in the former case, but the weakness is inherent and under certain conditions it will develop. One would therefore have reason to believe that a structure in which cement was used, which passed the Autoclave test, would be more lasting than if the cement did not pass the test. This is the logical conclusion in view of the findings on neat cement and cement mortars.

Microscopic investigation of concrete shows that a large amount of the cement used does not help to cement the mass together, mainly because of its coarseness. Records show that the cements passing the Autoclave test are in general much finer ground than those which do not. If by the Autoclave test we obtain finer ground cement or more "efficient" cement, the result is beneficial.

The results of the investigation show that "a cement originally unsound in the high-pressure steam test will usually be found sound if exposed to this test after ageing from two to six months." It would be as reasonable to say that lime putty with unslaked or unhydrated particles in it would be good for immediate use before it had aged properly. The ageing should take place in the material before it is incorporated in a structure and not after. If this test will disclose unseasoned cement more readily than the tests we now have, it is certainly worth while.

I see no valid reason why the final sentence of the previous editorial on the subject, which I quote, is not just as pertinent now as it was then. "The Autoclave test, although it may seem very rigid and severe, because of the ability to detect thereby poorly ground and slow hydrating cement, we believe is a step toward the ultimate goal of the cement industry, cement with lasting qualities."

ALASKAN TIMBER FOR U. S. RAILROAD

The Alaskan Engineering Commission, which is to build the government railroad from Seward on the Pacific 471 miles to Fairbanks in the interior, has received a permit from the Forest Service to cut 85,000,000 ft. of timber in the Chugach National Forest for use in constructing the new line. The permit was issued by the District Forester at Portland, Ore., who has direct supervision of the Alaskan forests, and is in conformity with the Act of March 4 last. The timber will be cut in designated areas along the right-of-way of the proposed railroad, which runs through the Chugach National Forest for several miles.

Experiments and tests of Alaskan spruce and hemlock are being made at the Forest Service laboratory at Seattle, Wash., and so far have substantiated the opinion of foresters that Alaskan timber is sufficiently strong for practically all structural purposes. Forest Service employes in Alaska are marking the timber to be cut along the proposed railroad; the cutting is done so that only mature trees are taken. This cut of 85,000,000 ft. will be the largest amount of timber ever felled on the Alaskan forests in one operation. The two national forests of Alaska contain about 78,000,000 ft. of merchantable timber and it is estimated by the Forest Service that more than 800,000,000 ft. could be cut every year forever without lessening the forests' productivity.

Change of Ownership

The three publications known as the "Railway Master Mechanic," "Railway Engineering and Maintenance of Way" and "The Monthly Official Railway List," have been sold and delivered to Mr. Ernest C. Brown, 280 Broadway, New York City.

The Bill of Sale includes the good-will, advertising, and subscription contracts, mailing lists, cuts, electrotypes, editorial matter, books of account, and all of the accounts receivable due from advertising and subscriptions. All advertising and subscription bills are collectable by the new publisher, to whom all remittances should be made.

This is effective as of July 19th, 1915.

Formerly publisher of

RAILWAY MASTER MECHANIC,
RAILWAY ENGINEERING AND MAINTENANCE OF WAY,
THE MONTHLY OFFICIAL RAILWAY LIST.

Chicago, Illinois, July 19, 1915.

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280 BROADWAY, NEW YORK
August, 9, 1915

To Our Patrons

The foregoing notice of "Change of Ownership" is self-explanatory. I have acquired the periodicals named therein and the office of publication has been removed to New York, from whence the August and future issues will be published.

I have laid definite lines along which these papers are to be developed and it is my hope and belief that our advertisers and subscribers will soon recognize the distinctive character, advanced policies and general timeliness which the periodicals will take on, and will continue the good will which they have heretofore extended to these publications.

I shall endeavor to deserve your consideration, but the papers will soon speak for themselves. I am now forming a corporation under the laws of the State of New York, to be known as the Railway Periodicals Company, Inc., to hold the ownership, all of the stock of which, save a few shares to be allotted to the officers and the employees of the proposed corporation, will be owned and retained by me.

Mr. Charles S. Myers, who has for many years been associated with the publications and is well known to their patrons, will continue as Vice-President and Business Manager.

I am bringing together a staff of experienced and skilled editorial writers—men who have had, through actual service, extensive practical knowledge of the technique of railroad construction and operation.

In the future kindly address all communications and make your remittances to the order of the Railway Periodicals Company, Inc.

Earnestly soliciting the continuance of your patronage, I beg to remain,

Very truly yours,

ERNEST C. BROWN.

A Long Span Deck Girder Bascule Bridge

The International and Great Northern Railway has recently placed in service a Strauss Trunnion Bascule Bridge over Buffalo Bayou at Houston, Tex. The new bridge replaced an old center pivot swing bridge, which had outlived its usefulness. The bascule span is a single leaf deck plate girder span, 110 ft. 6 ins. between centers of end bearings, and is counterbalanced by a concrete counterweight suspended beneath the roadway from the extremity of the main girders by means of trunnion connections. The counterweight is guided by a link forming one side of the well known parallel system of the Strauss designs. The accompanying views illustrate the new bridge in service.

The old bridge was a single track swing span 224 ft. long supported on stone center pier and abutments. The trunnion posts for the bascule are supported on the existing center pier, the upper portion of which was removed to allow space for the counterweight in the open position. The lower portion of the trunnion posts are embodied in concrete, being founded on the original stone pier and anchored thereto by means of bolts set into holes drilled in the existing stone pier and surrounded with cement grout. In like manner one of the abutments was utilized for the rest pier supporting the front end of the bascule.

In addition to the main girder span a 23-ft. steel approach span is used over the counterweight, one end framing into the inside trunnion posts and the other end resting on a timber bent. The space between the approach span and the old abutment is bridged by a timber trestle approach 89 ft. long, formerly spanned by one arm of the swing.

Few fixed deck plate girder spans are longer than this bridge, it is the longest single leaf deck plate bascule span in existence. The American Railway Engineering Association's Specifications of 1910 as supplemented by the Strauss Bascule Bridge Company's for this bridge were followed in the design and in the fabrication.

Though the present traffic does not exceed Cooper's E-50 loading it was thought expedient by the railroad management to design the bridge for E-60 loading to provide for future increase.

The main girders, which carry a single track, are spaced 8 ft. 6 ins. centers, the ties being directly secured to their top flanges, dispensing with the use of stringers and floor beams. The girders, however, are securely braced together by means of cross frames at intervals of from 16 to 20 ft., and by lateral bracing in the planes of both top and bottom flanges.

On account of the infrequent navigation at present the lifting mechanism is hand driven, through the machinery has been designed to permit the installation of an electric motor or gasoline engine when required. Operation at present is effected by one or two men revolving a cap-

Long Span Deck Girder Bascule Bridge—Great Northern Railway.

stan placed at the center of the 23-ft. approach span. The capstan may be used at high or low speed. When the bridge is closed, the front end of the span is locked by means of the hand driven latch bar. A hand brake is also provided which acts on the second shaft. This is set in its normal position and held in release during the operation of the bridge.

The bridge was erected in the closed position on falsework after the old swing bridge had been removed. Railroad traffic on the International and Great Northern was detoured over the Houston Belt and Terminal Rail-

Great Northern Bascule Bridge Over Buffalo Bayou at Houston, Tex.

way Bridge, adjacent. It is also a similar Bascule, completed in 1913.

Mr. O. H. Crittenden, Chief Engineer of the International and Great Northern Railway, directed the design and construction of the work. The Strauss Bascule Bridge Company of Chicago were Consulting Engineers and the American Construction Company of Houston erected the steel, which was fabricated by the Wisconsin Bridge & Iron Company of Milwaukee.

SUPPRESSING THE TRESPASS EVIL

"There ought to be a law passed—," is the way the average citizen delivers himself when he discovers what he thinks is an evil. We have nearly all the laws we require; what we want is to have them obeyed. Public sentiment must back up a law or it becomes practically inoperative. Public sentiment in the United States has grown to a point where it insists that every legitimate means be adopted for the preservation of the individual. The sanctity of human life is fully recognized, and progress has been made even to the point of protecting a man against himself. In this excellent work and in many other matters the public very clearly shows a tendency to rely on legislative action.

Legislation is, no doubt, a powerful instrument for the expression of public sentiment, but it must be remembered that any law to be effective must be backed up by healthy and sane public opinion. The creation of such sentiment has been the task to which the New York Central Railroad has addressed itself.

The State of New York is the only one in the East with a distinctly prohibitive law against trespassing on railroad property, and yet this law has failed to adequately check the evil, until supplemented by a vigorous campaign of education, inaugurated and carried on by the railroad. The figures given by the company's General Safety Agent, Mr. M. A. Dow, are instructive in showing the normal death and accident rate in 1913 on their four principal lines, and analogous figures for 1914 are also given, in which is evidenced the result of the spread of information concerning fatalities and injuries to trespassers. They show that twenty-one persons out of each hundred are alive today, who would probably have been killed, and thirteen persons sound and well who would most likely have been badly hurt, according to reasoning based on this table.

ACCIDENTS TO TRESPASSERS

	Fiscal Year Ending June 30th 1913		Fiscal Year Ending June 30th 1914		Decrease		Percent Decrease	
	K	I	K	I	K	I	K	I
N. Y. C. & H. R. R..	232	278	189	233	43	45	19%	17%
L. S. & M. S. Ry....	129	137	112	128	17	9	13%	7%
C. C. C. & St. L. Ry..	108	117	78	108	30	9	28%	8%
M. C. R. R.....	49	83	30	63	19	20	39%	24%
	518	615	409	532	109	83	21%	13%

It cannot be said that the New York Central took up this matter for the purpose of reducing compensation to injured men, or to the wives of those killed on the track. A trespasser on railroad property has no remedy against the railroad, and his heirs can have no legal claim. He has been injured or killed at a place where he had no right to be, and he did what he ought not to have done, and in the eye of the law of New York State he was guilty of a misdemeanor and was legally answerable, not to the company, but to the State, for the result of his conduct.

If in twenty years a cross-roads general store and post office, with a few inhabitants around them, had grown to be a town having a population of 181,379 persons, one would consider the average yearly increase of over 9,000 souls a fairly creditable showing. A town of that size, however, fairly represents the loss in killed and wounded which the United States has suffered through the results of railroad trespassing.

The large majority of those killed and maimed along railroad tracks are not "tramps" or "hoboes" stealing a ride. They are men of intelligence, and for the most part wage-earners. These men are capable of understanding the risks they run, and not only do they take chances themselves, but by their example they help to deaden the perception of others. There are a variety of reasons why the railroad track is preferred to the highway by many who go to and from home and factory along the forbidden path. The right-of-way is perhaps the more direct route. It is probably better drained and often much drier in bad weather than the ordinary road. It is always kept open in winter. It is level and smooth walking. In fact, the railroad track presents many advantages that appeal to the pedestrian. No one has ever told him, authoritatively, not to go that way, and it seems to him to be the sensible and the natural thing to do, and he does it.

As soon as he is upon the track he becomes the victim of his own mental make-up, and it is here that the real danger lies. This fact must be recognized and dealt with, if any remedy, legislative or otherwise, is to be effective. The man must be kept away from the track. This is the only method of securing safety.

There is ample proof that the railroad puts in force what precautions it can. It is compelled by law to warn, by bell or whistle, all persons about to pass over the line, at a level crossing. As a matter of fact, the company goes further than the law compels it. The locomotive bell is automatically rung during the entire trip, and the crossing signals are regularly given, yet this scrupulous compliance with the law is practically barren of results. It does not provide an adequate remedy. The reason for its failure is psychological; for strange as it may seem, the average pedestrian along the track usually fails to notice the sound signals from the locomotive. After carefully investigating this subject the railroad company has found itself confronted by a serious problem. The results of its examination may be stated somewhat as follows:

The railroad trespasser trudges along, full of his own thoughts. He may have started out with the deliberate intention of keeping clear of danger, and for a time he may have exercised what phrenologists would call his Caution Faculty. In time he wearies of this, especially if no tangible result immediately follows. Similar states of mind may be recognized in the man who at first shrinks back in dread on the edge of a precipice, but as nothing takes place to justify his fear, he gradually gives it up, and finally approaches the brink with a feeling of confidence, if not actual recklessness. His "caution" has been tired out, and seems to him to have been a useless expenditure of nerve force. The man may not be able to explain his behavior, but his action gives the key to his mental state.

Professor William James says that, "One of the most extraordinary facts of our life is that although we are besieged at every moment by impressions from our whole sensory surface, we notice so very small a part of them. The sum total of our impressions never enters into our experience, consciously so called, which runs through this sum total like a tiny rill through a flowery mead." This relative narrowness of consciousness remains a startling fact, but it cannot be ignored. What man is actively conscious, during a day's work, of the pressure of the clothes he wears?

We are all not only aware of, but we have all repeatedly experienced the difficulty of concentrated attention. Our mind selects for us, out of the welter of impressions thrust upon it, some dominant characteristic of landscape, sunset, foliage, stream, bird, companion, stranger, conversation, jest or thought of work or home, and in this act of mental selection all other sensations are necessarily shut out. We cannot attend to more than one thing at a time, and for the moment that one thing interests us and excludes all other thoughts. We have known a friend to sit down, intent to listen to a clock tuned to the Westminster chime, which gives out a musical phrase at each quarter of the hour. Our friend, engaging in conversation, remained practically deaf to the chiming of the bells, and after an hour's waiting said he had not heard the clock, although it had rung four times.

The man on the track is a conspicuous example of the same narrowed consciousness. He is, when on the track, one of the class who must be protected against himself. He may not have heard the hum of the rails ahead of the advancing locomotive, and he may have failed to notice the tones of the automatic bell, and the crossing whistle may have been among the sensations that his mind shut out, so that at the supreme moment he meets the locomotive utterly unwarned, and it rushes upon him with swift abruptness, and to him it comes from out a silent world.

In many appliances used in the mechanical world today the principle of protecting a man against his mental self has been recognized and this principle is constantly applied by transportation companies. Street cars are now built with folding steps and sliding doors so operated that the electric power is cut off, if even one door stands slightly ajar. The "dead man's handle" on many electric trains cuts off the driving current and applies the brakes, if through sudden sickness or a fainting turn, the motorman's hand relaxes its grip on the controller handle. In factories with electrically driven machinery a failure of the power current stops the machines, and they cannot be started again by the simple renewal of the current. In each case the machine man's starting handle must be brought to zero, and the operation of the machine can only take place again by the intelligent volitional act of the man. A stamping machine in a large factory requires the operator to use both hands to move the starting handles, so that after the work has been adjusted the man is compelled to remove his fingers from the danger zone in order that his machine may form the piece. In all these cases there is no persuasion or remonstrance and no reasoning with the man. His liability to failure is taken for granted and he is treated accordingly. He is saved from himself, and the old and selfish question, "Am I my brother's keeper?" has no longer any meaning in the industrial world today.

A further application of the principle has been adopted by railways, and the New York Central is one of them, in their endeavor to secure a greater measure of safety. They have found that, given a machine and man to operate it, the probabilities are that the man will fail first, or at least he will fail in a way that cannot be predicted. A machine when it fails can be made to "err on the side of safety," as is seen in the block signal systems, where loss of current or mechanical derangement causes the signal to assume the "stop" position. In the case of human failure, the resulting error is not constantly in one direction, and this complicates the problem of dealing with the man. These facts stand out very clearly in the New York Central's investigation of the whole subject.

It is said that when trespassers are arrested in very many cases magistrates fail to convict; and it is interesting to learn from the results of a town-to-town canvass by the New York Central that the cause of this laxity on the part of magistrates was largely due to misunderstanding the significance of the whole question. Many

do not know that according to the Interstate Commerce Commission figures for the year ending June 30, 1912, there were 5,284 trespassers killed and 5,687 injured. This means that 14 persons were killed each day for a year and 15 injured in the same time in the United States.

Some of the magistrates held that although trespassing existed, few if any accidents had happened in their districts, and that if they began to deal with offenders the company would arrest large numbers and the magistrates might thus become a sort of legal "short circuit" between the railway and the county jail. Others again, and with some reason, objected to the county where an arrest happened to be made being saddled with the cost of supporting the trespasser if sent to prison for what appears to many to be a trivial offense.

The magistrates, however, or a percentage so large as to amount to practical unanimity, soon perceived the enormity of the peril to the community as revealed by the figures here quoted, and that an incentive to the performance of a specific duty was indicated in the percentage of decrease in the number of accidents. The company realizing that all law, to be effective, must be backed up by enlightened public opinion, set itself to the legitimate task of moulding and directing the thought of those who had some claim to influence over others. The owners of factories were visited and the startling facts presented to them. They were invited to co-operate with the railroad in calling the attention of employes to the grave danger incurred by those who trespassed on railroad property and also to the fact that each man while thus endangering his own life set a bad example and was also guilty of an infraction of law. These facts were proclaimed by word of mouth and by notices conspicuously posted.

The railroad next turned its attention to the schools. Officials, teachers and friends of education were enlisted in the service. On a more minute analysis of the figures quoted, it appears that young children, boys and girls, are the thoughtless and ignorant victims of what was formerly regarded as of little or no consequence. They ran along the track, played among the standing cars, and with the heedless daring of youth courted danger in many forms.

The power for good in the hands of the school teacher is beyond all computation. It goes far beyond the compulsion of law or the pressure of social custom. The minds of the young are unresistingly open. In their early and plastic years "they'll take suggestion as a cat laps milk," and the lessons of the school room on the dangers of the road in time will save a multitude of workers to the State.

The New York Central Lines run through the States of New York, Ohio, Pennsylvania, Indiana and Illinois. In none of these States with the exception of New York and Pennsylvania is there any prohibitive law against railroad trespassing. The other States are considering statutory enactments. The laws yet to be made should be on broad and efficient lines. The railroad believes that this is a matter for the State to take up and that it should relieve counties of the burden of expense entailed by and resulting prosecutions. The law should recognize the principle that for the general good it is imperative that men be protected against themselves, because trespassing is largely due to want of reflection and ignorance of the risk involved, and of why and how any risk exits in the matter.

The part played by enlightenment and education should be remembered, as emphasized by the New York Central. The interests of the whole community are too large and too important to leave any room for confusing interpretations of law or fact. The dice are already loaded against the trespasser by the limitations of his own mentality. The risk taken is too often equal to the productive power of a worker or the life of the bread-winner of a family.

"SPEAKING OF TRESPASSERS"

In times past, when it was perhaps easier to secure a railroad right of way for tramping purposes than it is on some roads today, trespassers were frequent and at times great nuisances. The Long Island Railroad right of way was always in demand as a short cut for the fellow who preferred the ties to the old fashioned highway and at some seasons, especially when the hunting was good, the line was alive with hunters and their dogs.

On one occasion a president of the Long Island, now dead, came close to being the principal figure at a funeral.

He had some time before issued orders that every one not connected with the railroad should be promptly arrested as a trespasser in case he was found walking on the track or even crossing the right of way, except at a regular highway crossing.

On the occasion in mind the president, with his general manager, was taking a run over the line on a special. It was in the hunting season. Going at top speed the president ordered the train stopped forthwith, when he espied a man with his gun and dog climbing a fence to cross the right of way. The train stopped and was promptly backed up toward the invader, who was by that time mounting the fence on the other side to get into some neighboring woods.

"Say there," demanded the president, "don't you know that you are a trespasser? I want your name and address. I intend to have you arrested and jailed."

The fellow took his gun from his shoulder, slowly took aim at the president as he stood on the rear platform of his private car and replied with an oath: "Old man, get inside or I'll blow your brains out."

The president made a dash for the door and intrenched himself behind a center table in the observation end, as the hunter whistled to his dog and disappeared in the woods at a slow walk. White with anger and possibly some fear, the president ordered the train to move on, remarking to his general manager: "Get that rascal's name and put him in jail."

The name was never secured and the hunter has never been locked up for his threatening response. So far as known, after that little attention was paid to the matter of trespassers who tramped back and forth at their convenience at every season.

A CASE OF LOYALTY

Some time ago a section foreman on one of the Ohio railroads who, with the legal department in mind and in a spirit of unusual loyalty, made the following report on one occasion:—

"Yesterday morning on my way to work I found a hole in the fence and a hog on the track. I drove the hog back through the hole and repaired the fence. On my way back last night I found the hog on the track and another hole in the fence. I drove the hog back through this hole and repaired the fence once more. This morning at about the same spot I found the hog again and another hole in the fence, but the hog was dead. He was all cut to pieces. I can't say how this happened; but I am sure the hog died a natural death, and I am willing to swear to it."

Meeting of the National Scale Experts

The National Association of Scale Experts met for their twelfth semi-annual meeting at Hotel La Salle, Chicago, Monday, August 2. The final meeting of this pioneer organization was to approve the union with the American Scale Men's Association.

The meeting was called to order by the president, Mr. C. G. Stoody, and an address of welcome was made by the president of the board of trade. Next came the report of the committee on consolidation of the associations. This committee had power to arrange and complete consolidation with the American Scale Men's Association. The name of the amalgamated societies is now "The National Scale Men's Association."

The first paper was by Mr. N. C. Webster, in which he described the Richardson automatic grain scale. Rather strong claims were made as to accuracy of this scale, and those discussing the subject were agreed that where errors occurred they were due to insufficient knowledge of the machine on the part of the operators.

The next paper was on the "Range of Pivots" by Mr. H. O. Hem of the Strait Scale Co. The question was raised as to what the range of pivots should be; should it be an arbitrary amount, or vary in proportion to the length of the lever, or distance between pivots? Mr. Hem submitted four drawings showing that a lever of the first class; fulcrum intermediate between power and weight, with edges on a straight line. Here the arms would remain in the same relation to each other regardless of inclination of lever, while if the fulcrum pivot be given a range of ¼ inch per foot, or 5 degs., the lever weighs correctly so long as it is level and the connections are plumb, but even with connections plumb and pivots sharp, there will be an error as soon as lever is out of level. When this lever is so ranged, and the fulcrum pivot worn to a rounded edge on a radius between the end pivots the lever will then weigh correctly in any position, provided the pivot rest on an even bearing, but if the bearing be concave, the error will be the same as when pivots are sharp.

His conclusion was that as it was impossible to keep pivots always sharp, that a plus range to a small amount was advisable, depending on the loading of and conditions under which the lever should work. He advised that this be sufficient to cover permissible wear of load pivot in cross lever of track scale and an addition to admit of deflection.

The next paper on "Our Association," by Mr. C. T. Byerly, was a practically "get together" plea. No one man can know everything, but an association of men may approximate to it.

The next paper was on the relation of the weighmaster to the scale inspector, by Mr. H. A. Foss, chief weighmaster of the Chicago board of trade, in which the absolute necessity of co-operation was urged.

Mr. J. T. Stafford presented the claims of the "Special Alloy Scale Pivot Steel," the only product made in America specially designed for this use.

E. Motchman read a paper on "Who Wins, Scale Expert or Lawyer," in which was shown the need for a complete chain of evidence to verify a weight, in court.

A new type of self-registering automatic scale was described and its use explained by one of its inventors. It is to accomplish the same result as the Streeter-Amet device.

The next paper was by Mr. C. A. Briggs, assistant physicist of the Bureau of Standards, on "Merits of Long and Short Wheel Base of Test Cars." After discussion of possibilities of adjustment, he pays his compliments to that anomaly in engineering, the continuous weigh bridge, as follows: "This practically eliminates from consideration all track scales with continuous girder construction for the scale bridge. The general use of the continuous girder in the bridges of track scales is a practice which is a serious reflection on the scale industry. There is no theory nor practice of good engineering construction which can justify their use, and the results found in practice in the use of continuous girders are even more emphatic arguments against their use. As to the matter of loose main levers alone the Bureau of Standards in testing over 400 track scales, has found it to be the exception to find a scale with continuous girders which does not have one or more loose main levers, even when no part of the scale is loaded."

The summary and conclusions of the paper briefly stated are:

"1. Long wheel-base test cars are inadequate for properly testing scales and should not be used.

"2. Short wheel-base test cars should be used; the wheel-base should not be greater than 7 ft., and preferably should be 5 or 5½ ft.

"3. The most advantageous way of using the short wheel-base test car is not to center the car over the sections but to place each pair of wheels in turn over the sections."

At its conclusion some slides showing early forms of weighing machines were shown; followed by some of early elevators at Chicago, where grain was measured by bulk as it came from the elevator; some of present day work in Chicago elevators and a number for grain handling in the Argentine Republic, where it is handled in sacks altogether.

The next paper was by Mr. F. H. Hedwall of the Boston and Maine on "Inspection of Scales." He went into detail of that work and emphasized the need of carefully inspecting every part of the mechanism to uncover, if it existed, the great enemy of correct weighing, friction. He showed that the day of the stupid scale tinker whose cure all for scale defects, adjusting the nose iron, is passing. Mr. Hedwall complained of trouble in getting weighmen to do their work with care, and asked how others succeeded. Mr. F. H. Schlinkert of the Missouri Pacific spoke of his success by a system of reporting careless work to the auditing department, where the collections of revenue are made, and that department saw to it that better work was done.

The next paper was concerning "Grain Weighing Wagon and Hopper Scales," by Mr. W. F. Wellman of the C., R. I. & P. Ry. He said the fact that while great attention has been paid to grain weighing scales at great terminal points like Chicago not enough care has been bestowed on them at points of origin and at country elevators. He especially condemned wagon scales in shallow pits, and mentioned as a minimum, a brick or concrete pit not less than four feet deep. He spoke of hopper scales with insufficient foundations or foundations whose level might be affected by the adjacent bins being empty or loaded, thereby throwing scale parts out of level.

The last paper was by Mr. C. C. Neole, State Inspector of Weights and Measures of Minnesota. In his absence the paper was read by Mr. Norby. He deplored a tendency to give too much time of the association to heavy weighing and overlooking the smaller type of scale, and suggested dividing the association into sections, one given to the work of sealers and the other to the work of railroad weighing.

This concluded the work of the final meeting of the National Association of Scale Experts, but before adjournment it was ordered that the president and secretary write Mr. Neole a letter expressing the appreciation felt by the association for his unselfish work during the struggling years of the association.

PERFORMANCE OF TRACK SCALES

The very interesting article by C. A. Briggs which was read before the National Association of Scale Experts at their Chicago meeting in August takes up the track scale matter very fully. After an exhaustive discussion of the subject his summary and conclusions are condensed under three heads:

1.—Long wheel base test cars are inadequate for properly testing scales and should therefore not be used.

2.—Short wheel base test cars *should* be used—the wheel base should not be greater than 7 ft. and preferably should be but 5 or 5½ ft.

3.—The most advantageous way of using the short wheel base test car is not to center the car over the sections but to place each pair of wheels *in turn* over the sections.

The following figures show various forms of test cars which have been used or proposed for use:

Reports of special scale performances which appeared in our July number show what an important part, in the economical management of a railroad, scales play.

The large sum which may be saved each year by having in use correct weighing machines brings the subject home with especial force to the railroad manager. In these times of inadequate freight rates, comparatively small receipts and the enormous cost of operation, savings in this direction of weights is worthy of the most careful consideration.

The "National Scale Men's Association" has done great work and will continue to materially aid the railroads in their efforts toward economy and efficiency in management.

The report of the asociation, which met in Chicago on August 2, at which time a union of the Pioneer Scale Association with the American Scale Men's Association, under the name of the National Scale Men's Association, was effected, is published in this issue. The papers read were very interesting and the meeting was very largely attended. We feel that this association, being productive of so much good, should meet with every encouragement in its philanthropic endeavors.

TRACK SCALE INSTALLATION

Replying to some questions sent out from the Chicago office, Mr. B. B. Gordon, scale inspector of the P. R. R., very kindly replies as follows:

It is our practice to build the footings directly under each section, pier or wall. We do not treat the whole foundation as a unit, but reinforce each section separately.

Where it is necessary to use piling the same is driven at the end walls, sections, or piers, and are evenly distributed. After the piles are driven the concrete foundation is placed on top. The minimum depth for concrete on piles at each section is 4 ft. The form building, levels, location of anchor bolts, etc., are looked after by an experienced assistant scale inspector. The modern type of track scale requires very careful work in this respect.

We have not as yet attempted to make our scale foundations water-proof, as in most cases along our lines we have been able to secure very good drainage. We have some locations, however, where a water-proof foundation would be desirable. Until the last eighteen months we have been unable to secure any reliable formula for water-proofing foundations. I understand that there are more than forty different kinds of water-proofing compounds on the market, and that most of them, if not all, have proved worthless. If any one is specially interested in this subject I would respectfully refer him to the "Technologic Papers of the Bureau of Standards No. 3. Tests of the Absorpative and Permeable Properties of Portland Cement, Mortars and Concretes, together with Tests of Damp-proofing and Water-proofing Compounds and Materials." These papers are very interesting and should be carefully read by all scale inspectors interested in dry scale vaults.

We are providing ventilation for our 52-ft. 150-ton scales by a 6 x 12-in. ventilation in front of and against the scale house. The modern type of track scale has a rigid deck and it is possible to cover it with galvanized iron or other water and dirt proof material, which is highly desirable. However, this covering makes it impossible for the air to circulate, and this in turn promotes condensation which causes the metal to sweat, an undesirable condition. This sweating occurs only when the heating plant is shut off for the summer. Hence the necessity of the ventilator. In one of our scales the ventilator is aided in its work by the removal of the flue which connects the boiler and the main flue. We commenced installing the ventilators last spring, and so far they appear to be very satisfactory.

For several years we have been providing the scale vaults with heat whenever obtainable. We are giving this matter special attention, especially wherever we install the 52-ft. 150-ton scales. So far we have been able to provide all such scales either with steam or hot water heat, and we have found that when so taken care of they are in most satisfactory condition.

CORRESPONDENCE

Editor RAILWAY ENGINEERING:

In reply to your letter of June 30, I hand you herewith blueprints showing our methods of building scale foundations including the distribution of piling and water-proofing. This method of water-proofing is the only one we have used and it has proven very satisfactory.

We have not yet made any special efforts to provide ventilation or heat in our scale pits. However, we expect to provide for both ventilation and heat in the next scale we install.

(Signed) H. T. PORTER,
Chief Engineer, Bessemer & Lake Erie Railroad.
Greenville, Pa., August 9, 1915.

The best men mind their own business patiently, and are never thought of; the good helmsman never touches the tiller but in the last extremity; and the worst forms of misery are hidden, not only from every eye, but from every thought.—*Time and Tide.*

Long and Short Wheel-Base Test Cars

By C. A. Briggs, Associate Physicists, Bureau of Staudards

An accurate, thorough and reliable test of any scale consists in establishing whether or not it will weigh correctly any load within the capacity of the scale, for all normal positions of the load on the platform. The difficulty of supplying the requisite amount of standard weights for testing scales increases rapidly with their capacity until when scales of large capacity such as railroad track scales are reached special provision has to be made to supply proper facilities for testing them.

The first item which has to be supplied in testing railroad track scales is a large test weight or weights, and the second item required is a means for applying the test weights to the scale. The natural and most direct procedure has been to supply the test load in the form of a

Fig. 1—C. of G. Ry.

Fig. 5—States of Washington and Oregon.

car of supposedly known weight, and in general, such test cars have taken either of two forms, one of which is known as a long wheel-base test car, the other being known as a short wheel-base test car. It is the relative values of these two types of test cars that forms the principal subject of this paper.

The long wheel-base test cars are modified freight cars of some form or other. They have two 4-wheel trucks and the wheel base is generally 19 or 20 ft. The short wheel-base test cars generally consist of a compact car body, mounted on four wheels. The best forms of these cars in general use have practically a solid body, or are filled with 50-lb. weights which cannot shift about in the car. The wheel-bases of such cars vary from 5 to 9 ft.

Fig. 1 shows a long wheel-base test car used by the Central of Georgia Railroad. This is adapted from a freight car and in glancing at it, the fact that it is a test car is not at once apparent.

Fig. 2 shows one of the more modern forms of short wheel-base test cars which is used by the Norfolk & Western Railroad. The weight of this car is 63,000 lbs.

Fig. 3 shows the most recent development of the short wheel-base test car type. This has been designed and constructed by the Pennsylvania Railroad. The weight of the car is 80,000 lbs. and the wheel-base is 7 ft. The entire body of this car is made of two castings and there are practically no separate parts bolted to the car; there are, however, forty 50-lb. weights carried in a pocket in the top of the car for emergency use in testing smaller scales. A very important feature of these cars is that they have been equipped with roller bearings. According to recent advice received from Mr. Epright, scale inspector for the Pennsylvania Railroad, these cars have been in use for eight months and no repairs whatever have been required; and they have been able to maintain the value of these cars very closely. This is largely due to the roller bearings which require initially only a few pounds of grease which lasts about six months.

Fig. 4 shows the test car of the Bureau of Standards. This equipment has two principal advantages over those customarily used: First, the weights and the truck being transported in a specially constructed car need only be standardized at long intervals; and, second, graded tests from 5,000 up to 90,000 lbs. can be readily made.

Fig. 5 is a car used by the States of Washington and Oregon. The ordinary wheel-base of this car is 19 ft., but in use the end wheels are pulled up by means of chains and the scales are tested with the car resting upon the two inside pairs of wheels. The virtual wheel-base of the car is also used by Mr. J. W. Dugan of the Frisco Railway.

Fig. 6 shows a scheme proposed by P. D. McFarlane, scale inspector for the Minnesota Railroad and Warehouse Commission. In this method the weight is mounted on an axle and a very effective concentration of the test load can be obtained. The method of unloading and using the weight is indicated. It would be interesting to try this to determine its value.

In all of the forms of test cars in service the wheel-base is such that when the test car is centered over any section an appreciable portion of the test load is carried on adjacent sections and the indication of the beam is affected by the errors in the adjacent sections a corresponding amount. In making adjustments, therefore, the careful scale man estimates as best he can what allowance should be made in given section for the errors of the adjacent sections.

When two truck test cars are used the long wheel-base increases the distribution of the load among the sections and the matter of testing scales becomes complicated. The serious limitations of this form of test-

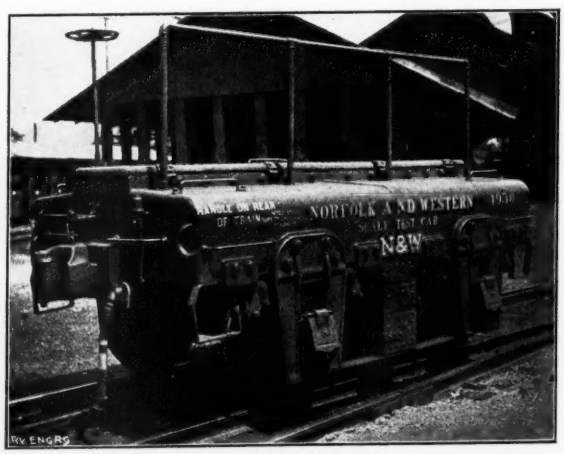


Fig. 2—Norfolk & Western Test Car.

ing equipment can best be appreciated by the aid of diagrams and figures.

The anomalous results which can occur when long wheel-base test cars are used can be multiplied indefinitely, but some particular cases bring out the various points. The 16.5 ft. wheel-base car is probably smaller than will be actually encountered, but it is mentioned here as it illustrates the character of the results which are obtained under similar conditions by longer wheel-

base cars on longer scales. Could anything be more absurd than to attempt to test such scales with long wheel-base test cars? It becomes a serious question as to whether or not a long wheel-base test car is worse than nothing at all. For instance, if an attempt is made to adjust a four-section track scale 50 ft. long by means of a 20-ft. wheel-base test car, it will be impossible to determine the errors in individual sections, and in adjusting the scale to cause it to weigh the 20-ft. test car correctly, the adjustments are just as liable as not to be made on the wrong section. The result will be that

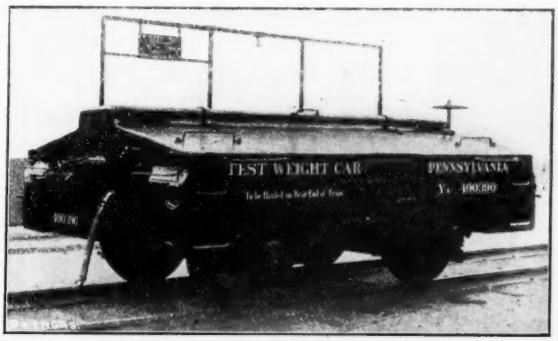


Fig. 3—Short Wheel Base Car, P. R. R.

while the scale has been adjusted to weigh the 20-ft. wheel-base correctly, cars of different wheel-bases may be weighed with greater errors than before the adjustments were made. In cases such as this the use of the test car has been worse than no test car at all, as a feeling of security has been produced on account of the test and adjustment of the scale and yet the actual errors which occur may be greater than before. This clearly indicates the helplessness of a scale inspector who has to use a long wheel-base test car, and further suggests how an astute individual interested in the falsification of weights would be able to manipulate a scale to his advantage and the scale inspector would be an innocent accomplice.

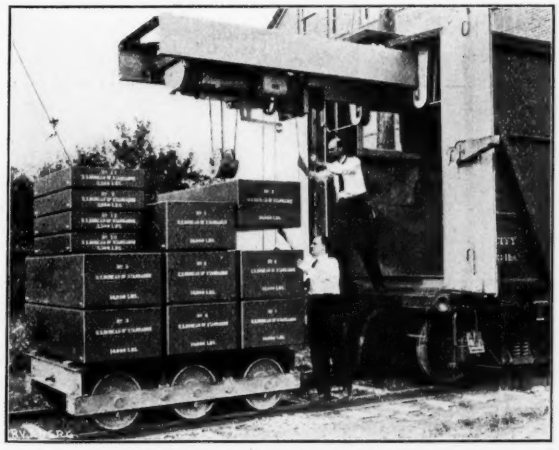


Fig. 4—Test Car, Bureau of Standards.

At the 10th Annual Conference of Weights and Measures, Mr. H. L. Van Keuren of the Bureau of Standards read a paper in which he proposed that the test car be not centered over the sections in making the test but that it be used with each pair of wheels in turn centered over the sections. In this way the load is carried on but two sections at a time while in the old method the car was centered over the sections, its weight was carried on three sections, the one beneath it, and the adjacent sections on both sides. He showed that by using the test car according to the new method, the computation of the actual errors of the individual sections was simplified, making it a more practical matter to compute in the field the actual errors of the sections, for making adjustments of the scale. In order to assist in the computations of these errors of the sections, a series of curves were given enabling certain values needed in the computation to be readily obtained. A trial and study of this method has been made with the result that it has now been adopted by the Bureau of Standards for its regular testing.

As a result of considering the various kinds of scales in use, the length of their sections, the character of their errors and variations, etc., it appears that the wheel-base of test cars should not exceed 7 ft., and that a 5 ft. or 5 ft. 6 in. wheel-base should if possible be used.

THE RECORDING ACCELEROMETER

This instrument is designed to make a graphic record of the acceleration of an electricaly-driven train, and the record is formed by a line drawn on a strip of moving paper. The amount of "coasting," and the retarding effect of the brakes are shown. The tractive effort at any given time can be calculated from the diagram. The instrument is very simple, and being contained in a wooden box, may be placed on any electric or steam locomotive, motor coach or trailer, and its operation will

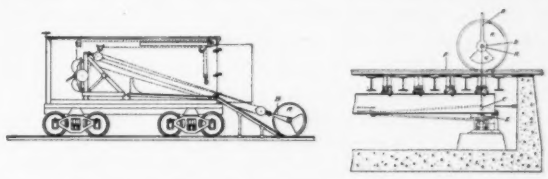


Fig. 6—Proposed Method for Concentration of Scale Load.

give a detailed account of the performance of the man operating the controller handle, and also record his performance with the brake.

The device consists, briefly, of a clock-work piece of mechanism which draws a ribbon of white paper, appropriately spaced and ruled, under the point of a recording pen. The paper moves at the rate of 6 ins. a minute. The operation of the pen or the extent of its swing is controlled by a simple arrangement. At the pivot-point of the pen controlling mechanism is a copper disc, with pivot-pin placed vertically. This disc has a hole through it at a certain point near its circumference. This throws the center of gravity of the disc slightly outside the pivot-point and makes the disc equivalent to a light eccentric. A gear wheel on the disc meshes into a spur wheel at the pivot end of the pen-arm. Any slight movement of rotation of the disc produces motion of the pen-arm and the pen itself, at the far end of its arm, swings horizontally and traces a small arc of a circle on the moving paper. The motion of the copper disc winds up a light coil spring made something like the hair-spring of a watch. It is the amount to which the spring is wound up that is really the measure of the acceleration, while the pen simply records it on paper.

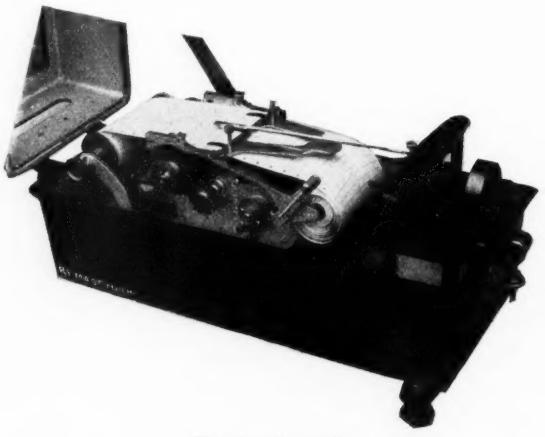
The whole apparatus uses the same principle as that which governs the action of a seismograph or earthquake recording machine. The principle used in the seismograph is that of the action of a heavy weight with a long, light arm, carrying a pen. The weight and arm together are so pivoted that the pivot is supported on the earth. A sudden, even though slight, earth movement carries the pivot out of its normal place, and the heavy

weight is momentarily left behind owing to its inertia. The quick movement of the pivot, the slow movement of the weight, together cause the pen at the end of the long, light arm to move more rapidly and through a greater distance than either of the others. In thus moving the pen traces a line which gives the horizontal component of the earth's disturbance. Another and separate piece of apparatus is used to record the vertical component of the shock. Both records are necessary. This is briefly the principle of the earthquake machine, and the principle is made use of in the construction of the accelometer.

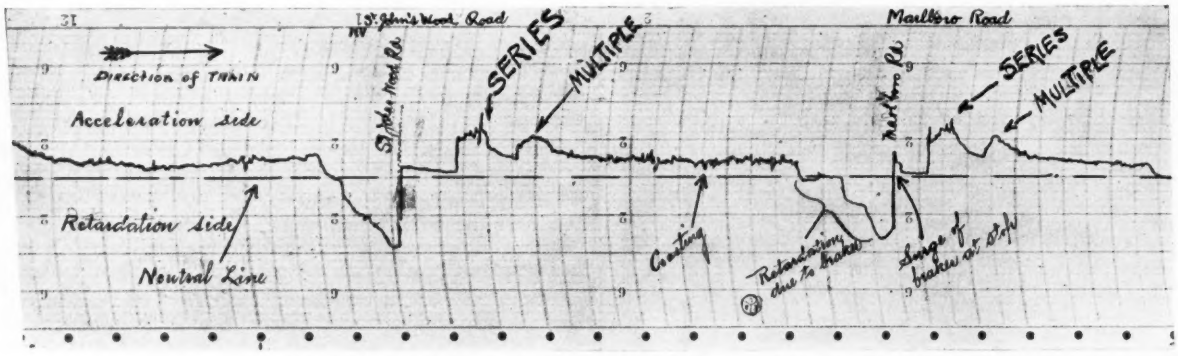
The instrument is set on the floor of locomotive or car with recording pen-arm at right angles to the direction of motion of the train. A comparatively sudden or even an easy start ahead, causes the heavy part of the copper disc, which we likened to an eccentric, to lag behind, just as the bulge of an eccentric would fall behind if it lay with long axis perpendicular to the direction of motion. This lagging or apparent swinging back of copper disc winds up the coil spring and operates the small spur wheels so that the recording-pen also swings forward and thus it traces a curved or notched line on the paper. This line shows the amount of acceleration the car or locomotive is then receiving.

The line drawn by the recording-pen indicates the degrees of acceleration secured by each notch on the controller handle. It shows the time occupied in "coasting," which is as important as recording the amount of current saving effected by the operator on the journey. The recording-pen faithfully puts down on paper the extent and duration of the retardation due to brake action, and tells whether the performance has been too severe for the comfort of passengers or whether a good stop has been made. It is not fiction to say that this recording mechanism can be relied upon to give the operator a good or a bad mark for the way in which he handles his train. He makes his own record, the machine simply puts it on paper. The device can be put in use without requiring the services of a man to watch it and may be locked up so that the record cannot be tampered with. It is easily adjusted at the start and if the run is made over ordinarily good track the record shows itself to be free from jogs and jolts. If the track is rough, a man may have to travel with the instrument in order to make sure that the initial adjustment remains intact.

The accelerometer may be used on a steam locomotive, a street car, a taxi cab or other vehicle on which it is desired to secure a record. There is also another use to which this machine may be put and in its other sphere of action it becomes what is called an Equilebristat. This other record gives the condition of the track and is had by turning the instrument round and placing it so that the pointer, with pen, will be parallel to the direction of motion of the train. In this new position the record is not one of acceleration or of deceleration. It now graphically traces the record of the swaying of the car in rounding curves and shows any side-wise shocks that the car receives. In the equilebristat position the instrument may show by the line traced by the pen that a certain curve was passed over at such a speed that the elevation of the outer rail more than neutralized the centrifugal force of the train at that point, or again the same curve if run over at a much higher speed may give a record indicating that the centrifugal force is too great for safety with the same elevation of the outer rail, which was quite permissible at the slower speed. The importance of such a record, mechanically obtained from actual conditions, becomes apparent when we remember that the increase in centrifugal force is as the square of the speed. The lateral movement of the train on a curve may give a very satisfactory indication of the comfort experienced by the passengers. The instrument is in use on the Great Western Railway in England and the South Nigerian Railway of Africa for equilebristat use. For acceleration it is employed on the Metropolitan (underground) London, the London, Brighton and South Coast, Lancashire and Yorkshire, and the Midland Railways. It is the invention of Mr. H. E. Wimperis, who is an associate member of the Institute of Civil Engineers and of the Institute of Electrical Engineers of Great Britain.



The Accelerometer.



Graphic Record Made Between St. John's Wood Road and Marlboro' Road.

A special demonstration of the accelerometer was given to the managing editor of RAILWAY ENGINEERING AND MAINTENANCE OF WAY, through the courtesy of Mr. C. Jones, locomotive and chief electrical engineer of the

Metropolitan Railway. The trip was made in company with Mr. Frank Raney, who is Mr. Jones' assistant.

Our illustration shows that portion of the line between St. John's Wood Road and Marlboro Road, London. The record reveals very clearly the acceleration at the start when the motors were in series, the slight fall in speed and the acceleration due to the multiple position of the controller. The "running" line on the paper shows some oscillation of the cars. That portion below the center or neutral line on the paper shows the "coasting" done. Approaching Marlboro Road station the retardation due to brake action is clearly in evidence and also the slight surge of the train at the moment of stop. Leaving Marlboro Road the accelerometer distinctly gives the effect of the series and the multiple positions of the controller handle. It is thus easy to judge of the efficiency or otherwise in train handling of the man in charge, and the condition of the track.

HISTORY OF THE SUISUN SINKS

By A. A. Willoughby.

The final conquest of the well-known Suisun sinks in California after many years of effort and hundreds of thousands of dollars had been spent by the Southern Pacific Railway has attracted a great deal of interest as to the methods employed. The continuous settlement of the roadbed through the marshes entailed a huge expenditure of money and constant attention, and this piece of track, about nine miles long, gained the reputation among railroad men of being one of the costliest pieces of roadbed in the country. A simple plan of bank widening over an area 16 to 18 ft. on either side of the tracks, acting as a blanket and having a counter-balancing effect in distributing the load stresses of heavy traffic, solved the problem To-day this section is one of the most solid of any in the system. Up to the time the plan of bank widening was employed a great many sink trestles and cribbing had been put in and thousands of carloads of material had been dumped into the sink area without any permanent diminution of the trouble.

The two years, 1913 and 1914, saw the plan worked out to a successful conclusion at a cost of approximately a quarter of a million dollars. It was not until February of this year that all slow speed orders were removed and normal speed permitted. This has since prevailed without interruption. Sufficient time has now elapsed to show the success of the plan. Some parts of the track have been in use for over two years, all of it has passed through one rainy season, some of it through two, so that there has been opportunity to study the results attained, under all conditions. The last two rainy seasons have been the heaviest for years.

The Southern Pacific Short Line from Oakland Pier to Sacramento skirts the southern edge of San Francisco and San Pablo bays to Port Costa, where trains are ferried across the Sacramento River to Benicia. Shortly after leaving Benicia, the right-of-way runs through marshy, tide-land country, 11 miles to Suisun. Underlying a strata of decayed tules and marsh growth, is a thick belt of blue mud extending to an undetermined depth throughout this region. The entire region was formerly a large body of water and the mud is probably the result of a combined action of tide-borne matter and sedimentary depositions or detritus brought down from the mountains by streams. The first roadbed was completed through this marsh in 1879 and was constructed by the Northern Railway Company. The fills were spread out on the marsh and in the softer portions, trestles were put in. In many instances no footings were found for the piles and other piles were driven down on top of each other. The fills from the beginning showed continuous settlement. The road was later taken over by the Southern Pacific and was under the jurisdiction of the Sacramento division until 1889, when it became a part of the western division.

The settlement of the roadbed continued up to February 1905 at the rate of 6 to 12 ins. a year, in the marshy section of the line, with the exception of the trestles which had never given any trouble. Two or three deep sinks had developed between Cygnus and Suisun during this time but had not seriously impeded traffic. In places, the track between the trestles was 3 and 4 ft. below grade. Early in 1905 a steam shovel was put at work in a pit near Benicia and the roadbed ballasted to grade. The work was nearly completed when a work train passing over one of the newly ballasted sections, caused the breaking away of the bank. This led to the first serious settlement of track which had been encountered up to that time. The sink started at this point and extended about 500 ft. It increased in a couple of days to a length of 1,000 ft. Before it was finally stopped, 65 ft. of filling had been dumped under the track at this point. Six more sinks soon developed, the first one about a mile west starting with 300 ft. of settlement, later increasing to 1,500 ft. and taking 70 ft. of fill. The others followed in rapid succession about a mile apart. A great amount of material and over 1,000,000 ft. of lumber for cribbing were used. Troubles continued until August of that year. The settlement continued to be gradual until the morning of the earthquake, April 18, 1906, when the track sank considerably at one point.

It was determined at this time that the material used in filling had been too heavy, and therefore tuffa, a light limestone rock, was thereafter used in the operations. Between April 1906 and June 1907, 19,500 carloads of tuffa, 1,027 cars of gravel, 49 cars of lumber, and old bridge material, 15 cars of planking for shimming and cribbing and in the neighborhood of 65,000 old ties in addition to material from the Benicia pit, went into the sinks. Trouble was becoming serious and numerous methods were tried, without success, and the line was kept open only by trains running at reduced speed over the worst sections of track. On numerous occasions the road was closed to traffic and trains detoured between Port Costa and Sacramento via Stockton. Ballasting was continued through 1907 and 1908 and to April 1909 but the settlement continued.

Test borings were made in April 1909 at Cygnus, Teal, Jacksnipe, Sprig, and Tokio, points in the sink area, to determine the conditions of the fills and the formation of the underlying material with the following results:

Cygnus. Three wells were bored, one on each side of the tracks and one between the main line and siding. The latter showed 8 ft. of yellow sand, clay and gravel, 9 ft. of white and yellow sand, clay and gravel, 18 ft. of yellow sand, clay and gravel. Below this point were decayed tules and blue mud. The borings outside the tracks showed 13 ft. of yellow sand, clay and gravel underlaid with the tules and mud.

Teal. Four wells were bored. The first, 30 ft. cut from the main line showed 14 ft. of filling and 6 ft. of decayed tules with blue mud beneath; No. 2, bored 8 ft. out on the same side as No. 1, showed 16 ft. of filling; No. 3, taken 8 ft. out on the opposite side of the track, showed 32 ft. of fill; No. 4, 14 ft. out, gave 26 ft. of fill, all underlaid with 4 to 6 ft. of tules over the mud.

Jacksnipe. Two wells, one on either side of the track showed 8 ft. of fill, 2 ft. of decayed tules, and blue mud.

tracks showed 10 to 12 ft. of fill, 3 ft. of tules, and mud. The well between the tracks showed 24 ft. of fill over tules and mud.

Tokio. The wells on either side of the track showed 5 ft. of fill, 3 ft. of tules, and blue mud.

The rails through the sink territory at this time had been 75 lbs. but the track was relaid with 90-lb. steel to accommodate the increasing traffic. No serious trouble with the sinks occurred during the latter part of 1909 and 1910 but the gradual sinking still continued, necessitating constant attention. The work of double tracking was started in April 1911 and the work of widening the roadbed was pushed forward. The settlemen troubles really dated from the time of installing the double track roadbed. The new roadbed held up fairly well for several months then began to show signs of sinking. Shortly afterwards the old fills, particularly at mile post 40.5 and Cygnus, began to go down. On Dec. 1 the track

The Sink at Mileage 45½ on the Southern Pacific. Note Track Ditch and Bank Caused by Sinking of Track.

at mile post 40.5 settled 2 ft. in 24 hours while the new

Sprig. Three wells were bored. The two outside the fill had slipped out of sight. Cribbing was resorted to. The Cygnus sink although going down fast, held up enough to permit train operation. The mile post 40.5 sink broke away two days later for about 300 ft., 100 ft. going under water 10 ft. This latter was largely due to the washing out of the gravel roadbed and to the high tides then prevalent. Troubles were encountered at these points for the rest of the month and traffic was frequently suspended. The sinks at Jacksnipe and Teal began to give trouble and the work of filling in, was kept up day and night. During January 1912, a box car loaded with cordwood was derailed and sank out of sight in the marsh. As soon as it disappeared, the sinking stopped. "Shoo-fly" tracks were installed at numerous points. The shoo-fly track at Teal was filled with loaded cars to check the upheaval but without success, as the material pushed up between the tracks. It was necessary to raise the tracks after the passage of every train on account of the rapid settlement. About this time the track was being raised as much as 4 to 6 ft. every 24 hours and the tracks were in water part of the time. Approximately 300 ft. of double track trestle were constructed and train service was resumed.

During February, March, April and May, 1912, conditions improved somewhat, but constant attention was required. Cribbing was resorted to at the Jacksnipe sink. The method of cribbing employed was as follows: Old bridge stringers were placed longitudinally under each rail beneath the ties. Cross stringers were placed 2 ft. apart under these, then another row of longitudinals, one of cross stringers and so on until the track was brought to grade. Twelve of the larger sinks required constant attention and were placed on cribbing. It was decided in October to do no more cribbing but to drive piling in the troublesome places. One track would be worked at a time and the traffic diverted to the other track and vice versa. The work was continued through January, 1913. The following are the figures on the six trestles driven, at the sinks.

No.	Location	Length	Cost
1	1 mile west of Pierce	315 ft.	$2,882.79
2	½ mile west of Pierce	405 "	4,439.08
5	1 mile east of Pierce	360 "	5,028.35
8	600 ft. west of Mile Post 44	315 "	2,493.03
10	900 ft. west of Mile Post 44-B	480 "	3,874.30
12	1,000 ft. west of Mile Post 46	330 "	3,385.40
		2,205 ft.	$22,102.95

In addition to the above, cribs had been installed during 1912 at the following points: Mile Post 38.8, 200 ft.; Mile Post 39.7, 400 ft.; Mile Post 40.5, 200 ft.; Mile Post 41.1, 300 ft.; Mile Post 41.3, 425 ft.; Mile Post 41.6, 150 ft.; Mile Post 45.7, 200 ft. The following sinks were filled that year: at Mile Post 42.4, 400 ft.; Mile Post 43, 500 ft.; Mile Post 43.3, 1,900 ft.; Mile Post 44.4, 2,200 ft. The year 1912 had seen expended $103,-

924.25 on account of the sinks and was the most costly year since the road had been built.

The situation on January 1, 1913, which was the time when the change in the handling of the sink situation was made, showed that there was in the sink territory at that time, approximately 2,205 ft. of trestle work, 2,075 ft. of cribbing and there were numerous sinks which had been filled with gravel and refuse. The sinks appeared to be under control for the time being as far as rapid settlement was concerned, but it was impossible to maintain a constant train speed schedule or to keep the track up to grade. It was plainly evident that while the previous methods employed had succeeded in providing temporary relief, some different method would have to be used, if a cure for the sinks was ever to result.

For the first few months no extensive work was done in this territory beyond keeping the track to grade and the line open to traffic. Meanwhile a plan of campaign was being worked out. In consulting data compiled from the test borings made in 1909, it was noticed that the material deposited from the cars had settled in a compact fill, directly under the tracks, with little outward slope, thereby concentrating practically all the weight within the space between the outer rails of the double track. This excessive weight within such a narrow area, resting on a foundation of decayed tules and blue mud which was not capable of steadily sustaining heavy loads, and had thus caused the settlement, and also had a tendency to force the tules up on each side of the right-of-way, in some instances as much as 10 ft. above the mean elevation of the marsh. The line of post holes, 8 ft. apart for the right of way fence, offered a line of least resistance to this outward and upward movement of the tules and to the cracking of the surface, which usually occurred along the fence line, and thence spreading over the right-of-way and beyond. The marsh is subject to tidal influence, and it was apparent that the greatest trouble occurred during the periods of low and high tides, there being a variation of 6 ft. between the extremes. The surge of the water at high tide would help to support the embankment, but the low tides removed this sustaining pressure, and the worst sinking occurred. The sinking would manifest itself largely by the in-leaning of the tops of the telegraph poles.

It was decided that if the filling was extended beyond the tracks for 6 or 7 ft. on either side, and using the upheaval banks as a bulkhead for the material, it would prevent the further upheaval of the tules and hold them down. This arrangement would give no room for upward or side movement, and thus would tend to distribute the excessive weight of the embankment and of the traffic. This fill would also act as a blanket over the marsh and possibly find a firm foundation beneath. The previous fillings had no side slope and consequently could not afford a secure footing. This blanket finally was made wider until it extended to an average width of 16 to 18 ft. from the outer rails.

The method employed was to remove the upper portion of the sink trestles and cribbing and to dump in a vast amount of material, and to continue doing this until the settlement abated. On the trestles, the stringers were removed, leaving only the caps and the piling, and where there was cribbing the first layers of stringers were taken out. The track was jacked up on one side and then on the other, and after the removal of the stringers the cars of material were run over and dumped as fast as necessary to keep up with the settlement. Three work trains, one hauling and two unloading, were used in handling the material. Plow cars, steel side dump cars, center dump and ordinary flat cars with hand shoveling were utilized. A spreader was brought into use for getting the material away from the tracks. By only removing the upper portions of the trestles and cribbing protection was afforded against too rapid sinking of the tracks during the filling. Work was begun at the west end on May 1st and pushed eastward as fast as possible. Arrangements had been made to have a hundred car loads of material on hand daily, extra gangs of workmen were put on to provide for contingencies and the work was started near mile post 39.

The sink at this point was filled by May 14th and showed no signs of settlement. Work was begun on the next sink about a mile east. The cribbing settled badly, and early in June the tracks were down to water level, but no serious trouble developed. In October, at Cygnus No. 3 sink, the west bound track broke away and the east bound showed a leaning tendency. Before this sink was finally conquered over 1,200 ft. of settlement appeared, and during the raising of the track it sank from 55 to 142 ft. in places, and required 2,513 car loads of gravel. At Cygnus sink No. 2 the settlement extended 428 ft. and the track sank 146 ft. while being raised. It required 1,663 cars of gravel, earth and crushed rock to complete the fill. One of the sinks, if not the worst, developed at mile post 45½, and the trouble continued there until early this year. The track sank 116 ft. while being raised. The settlement was 560 ft. in length and took 1,506 car loads of material. About 100 ft. east of this point, and practically an extension of the same sink, there was a sinking of 57 ft. and 833 car loads of material were used. At mile post 45 the sink was 410 ft. long and required 1,283 cars of gravel, the track sinking 81 ft. These are instances of some of the more aggravated cases.

The work was pushed with all possible haste during September of last year and by the end of that month the decks had been removed from all trestles and the fills completed and all the cribs, with one minor exception, had been filled in. While there was slight settlement at some points, the bank-widening plan was proving its efficacy and the filling in was continued until the settlement entirely abated. The work was considered finished in February of this year. On January 1st, 1913, slow orders were in effect over the whole sink area. There were seven stretches of west-bound track requiring a speed of ten miles an hour and six stretches of east-bound track were included in this order. A thirty-mile an hour order was in effect over the rest of the sink region. On January 1st, 1914, normal speed was allowed over most of the section, there being but seven short stretches on the west-bound and east-bound tracks requiring reduced speed. On September 1st there were only three minor pieces left, and in February normal speed was in effect over the entire line.

Most of the Southern Pacific records which would shed light on the early troubles with the sinks were burned in the San Francisco fire of 1906. It is known from the record that during 1905 and to April 1906, as much as $99,706.92 was expended in labor and material. From April 1906 to 1913, when the work was completed, there had been spent $688,647.77, of which $147,081.40 in 1913, and $101,388.69 in 1914, were spent on the bank-widening plan.

The person to whom the credit of conquering these sinks is due is Mr. J. D. Brennan, superintendent of the Western Division. Shortly after he assumed the superintendency in 1913 he evolved the idea of bank-widening to control the sinks and had personal charge of the work throughout. He has had the satisfaction of seeing his plan carried to a successful conclusion.

Summary and Details of Railway Coaling Plants

From throwing wood into the engine tank, in olden times, at some handy woodpile, and later shoveling coal from a carload, nearby, into service on the engine, down to the present day convenient coaling stations adopted by most of the railroads, is a long step. A high point of efficiency has finally been reached by the ordinary process of evolution. Today we find elaborate appliances for this purpose, which are expensive, perhaps, in the first instance, yet from the standpoint of efficiency and economy, in the end, they are indispensable. Ingenuity has devised a great variety of plans. The following are some of the well-known types of coaling stations which we now find in use here and there throughout the country. We have not undertaken to go into details regarding all these types, but we present two or three designs with some exactness which may be of especial interest to our readers.

COALING FROM CARS AND JIB CRANE TYPE

This type of coaling station is used where the engines are needed as soon as they can be cared for, where they come bunched or where the operator cannot do all the coaling in connection with his other work at the time desired. It is recommended that there be in addition to the elevated track an elevated platform with buckets of about one ton capacity into which coal can be shoveled at different times, these buckets to be raised by a deep crane which can be operated by hand or by air from the engine and to be emptied when the engines come in greater numbers than the men to take care of them.

THE WILLIAMS-WHITE TRESTLE TYPE

In this type of coaling plant the receiving track is elevated on a trestle and coal is shoveled into bins on either side. These bins can be filled with different amounts of coal so that this type of plant accommodates a larger number of engines than the deep crane type as far as coal storage is concerned.

THE TRESTLE TYPE

This type provides for a high trestle with the coal car track on top of the storage bins 30 or 40 ft. above the coaling tracks. The cost of switching is increased, but by the use of self-clearing cars the cost of delivering coal from the cars to the bin is decreased. This type of plant is constructed and equipped with a hoisting engine for hauling the coal cars up a 20 per cent. grade and also with a long 5 per cent. grade trestle where the locomotive is used for hauling coal cars.

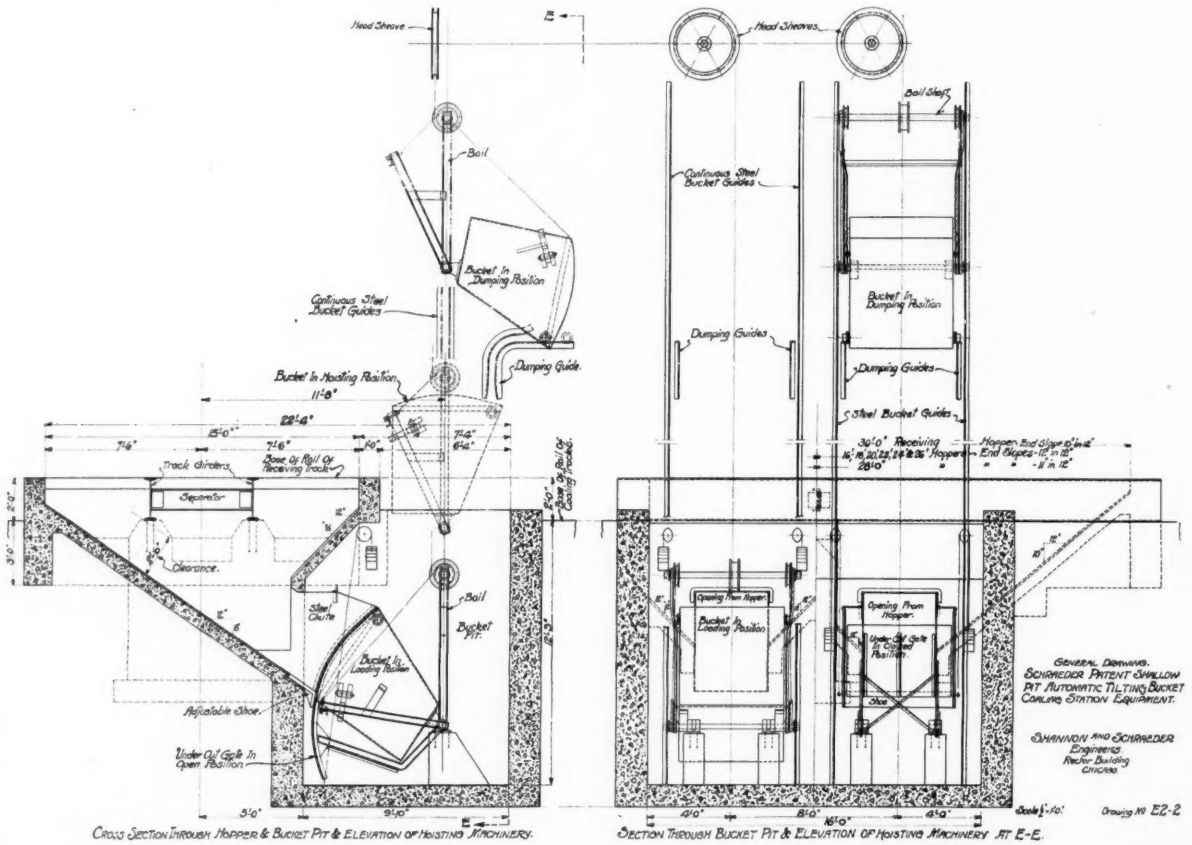


Fig. 1. The Schraeder Shallow Pit Automatic Tilting Bucket Coaling Station.

LOCOMOTIVE CRANE TYPE

At terminals, where the demands are not too great, coaling can be done by means of a locomotive crane handling the coal direct from flat bottom cars to a locomotive. This crane can also be used for switching the coal cars if necessary and can handle cinders and sand.

To allow the use of drop bottom cars a pit can be constructed from which the crane can handle the coal or a trestle can be built on which the crane can work so that it can load direct into bins of small capacity. Its value is great in emergency situations and at points where, because of impending changes, the construction of a permanent plant is unwise.

A CLAM-SHELL BUCKET AND TROLLEY TYPE

A type of plant using a special bucket of the clam-shell type operated on a trolley. This bucket can handle coal direct from a pit or from flat bottom cars into bins over the tracks and can also handle cinders.

THE BALANCED BUCKET TYPE

This type of plant is now used by many of the railroads in the United States and is especially interesting at this time with the introduction of the shallow pit. This plant is very desirable where the space is more or less limited. The coal is dumped directly into the receiving hopper from dump bottom cars and hoisted and discharged into the bins by means of two large balanced

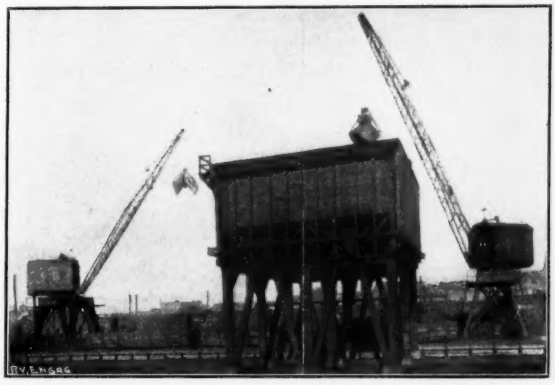


Fig. 2. Gantry Cranes with Power Wheel Buckets.

buckets having capacities ranging from one to two and one-half tons each. The balanced bucket type plants now erected are equipped with automatic measuring and loading devices intermediate the hoisting bucket and receiving hopper. This involves a pit 22 to 28 ft. deep. For a number of years two objections have been had to this type of plant. One was the depth of the pit, and the other, the fact that unusually long bins were difficult to fill. Both of these objections have now been overcome. Tram cars are now used to distribute the coal into the bins and several shallow pits are now being introduced.

THE LINK-BELT BUCKET CONVEYOR TYPE

This type of plant requires more machinery in the way of equipment when compared with the balanced bucket type.

THE BELT CONVEYOR TYPE

This type of station provides for a continuous belt of rubber and cotton on an incline of about 32 degs. for conveying the coal from a receiving hopper which is equipped with a reciprocating feeder. In some locations where plenty of space is available a yard storage can be provided as the receiving hopper in this type of plant is placed at a considerable distance from the storage bins. The objection to this type of plant is the expense of belt renewal and space required for the plant.

For railway coaling stations where a large storage of coal is required the following combinations have been used:

THE LOCOMOTIVE CRANE IN COMBINATION WITH A MECHANICAL COALING STATION

This type has been adopted by the Louisville & Nashville Railroad at three locations, where large mechanical coaling stations of reinforced concrete and steel are being constructed. The receiving hopper is enlarged at the back to form a pit of sufficient size to accommodate the grab bucket of the crane. The crane is located

Fig. 3. Traveling Gantry Crane.

on the circular track back of this hopper, this track centering on the hopper. Coal is dumped into the hopper from the receiving track and handled to storage by the crane. In reclaiming from the storage pile, coal is picked up by the crane and discharged into the hopper from which it is handled to the overhead coal hopper by means of balanced buckets.

THE SWIVEL BRIDGE TYPE.

The receiving hopper is constructed practically the same as for the locomotive crane type. This type lends itself to a much larger storage pile and greater handling capacity than the locomotive crane. The inner trucks

Fig. 4. A 300-Ton Fireproof Coaling Station.

of the bridge run on a circular track and are held in position by an arm extending to a central swivel point and attached to the pivot pin. The outer tracks also travel on a circular track, the center of the circle being the swivel point above referred to. Coal dumped into the pit at the side of the receiving hopper is picked up by the grab bucket on the bridge and placed in storage. In reclaiming, the coal may be reached by the bucket at any points in the pile and brought back to the receiving hopper from which it can be hoisted to the storage bin by means of balanced buckets.

THE CABLE AND DRAG SCRAPER TYPE

This method has been adopted by the Southern Railway, the Canadian Northern, and others. The storage pile is located directly back of the receiving hopper. The coal is dumped into the hopper and conveyed to the top of the coaling bucket by means of balanced buckets, or the coal can be deflected into a chute at one side of the tower which discharges into the storage area. The coal is then spread over this area by means of a drag scraper operated from a drum in the tower over the hopper. Two scrapers are usually used on an endless cable which is attached to masts of steel or wood, one taking the coal out to storage, while the other is returning empty.

THE CABLEWAY EXCAVATOR TYPE

This method contemplates having the storage pile between the receiving hopper and the coal pocket. The cableway equipment conveys the coal to the storage pile as well as the coal pocket. A mast is provided at the coal pocket of sufficient height to enable the drag bucket to discharge into the bin. The main cable is anchored directly behind the receiving hopper. The hopper is so constructed that the drag bucket may scrape toward the coal bin over a sloping concrete floor. The coal is then distributed in a pile between the hopper and the coaling station. In reclaiming, the coal is picked up by the grab bucket and discharged directly into the coal pocket. This equipment is also adapted to the "under-water" storage.

THE SCHRAEDER SHALLOW PIT COALING STATION

The Schraeder shallow pit coaling station operates with an automatic tilting bucket. (An outline sketch is shown in Fig. 1.) When the bucket comes to rest at the bottom of the pit, it tilts toward the coal, hopper displacing an undercut gate and filling the bucket. When the hoisting machinery reverses its direction, the pull on the bucket brings it to a vertical position, and in so doing pulls up the gate and cuts off the feed of coal. When the bucket reaches the top and makes contact with the dumping guides the coal can be dumped in any desired direction. The buckets may be of 1½ or 2½ tons capacity. By the elimination of a feeder or measuring device which generally occupies space between the receiving hopper and the bucket, the depth in the pit which would be occupied by such a device can be saved. With this arrangement the normal pit depth is 12 ft. 3 ins. against 26 ft. to 28 ft. This must be figured as an economy in many ways, such as pit excavation, concrete, and distance the coal must be raised. Another method of utilizing this saving may be to install a crusher in the space that would otherwise be occupied by the eliminated feeders or measuring device.

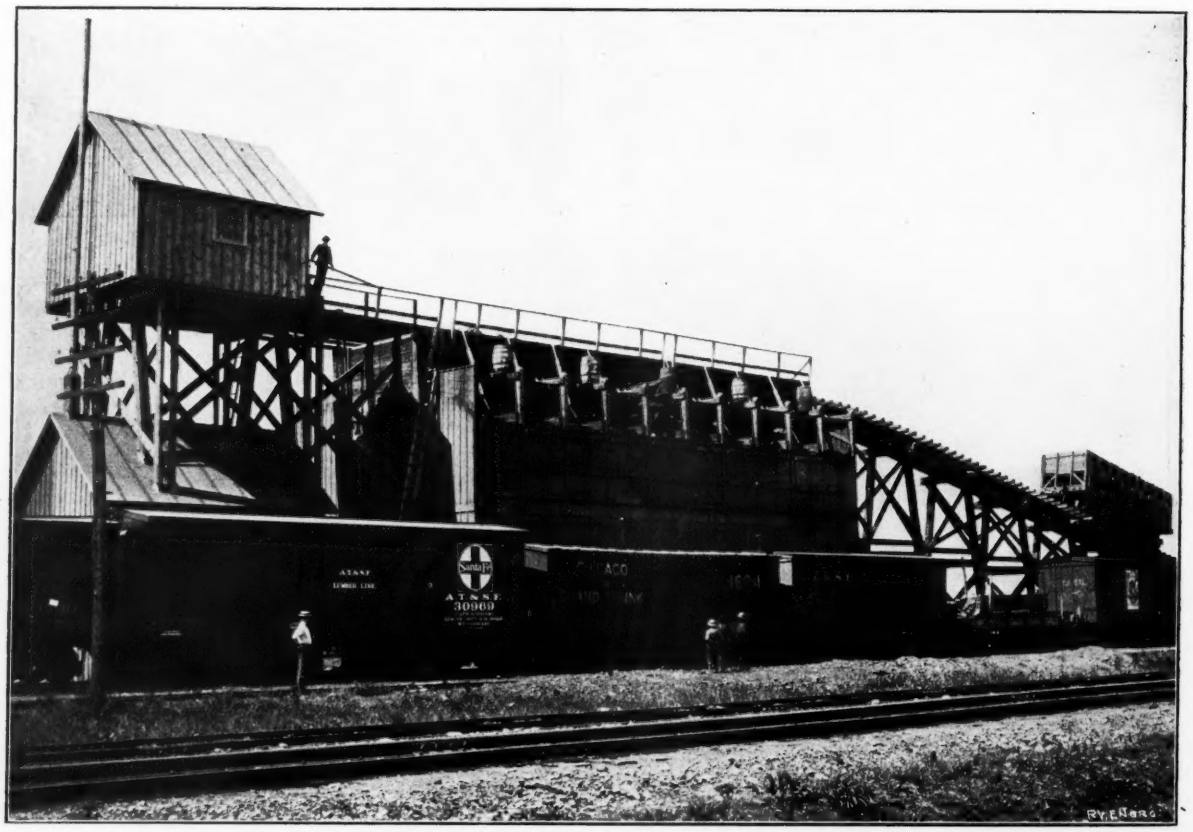


Fig. 6. Gasoline Operated Coaling Station.

Fig. No. 2 shows two Gantry cranes used by the Boston & Maine R. R.. These are 10-ton machines mounted on a gantry which has a height of 15 ft. be-

tween the truss and the rail. The gauge of this is 15 ft. and wheel base is 15 ft. also. They are operated with a 50-ft. boom and will handle a one and one-half yard clam shell bucket loaded with coal. The advantage of the gantry structure is that the coal cars may pass underneath. These cranes, of course, may handle coal directly from the coal cars to the locomotive tender, or from the cars to the pocket as shown in the sketch.

Fig. No. 3 shows a gasoline-operated crane. The crane shown is built to handle a three-quarter yard clam shell bucket loaded with coal at a radius of about 20 ft. This enables the crane to coal a locomotive from a car standing on parallel tracks spaced about 14 ft. centers.

Our illustration No. 4 shows a 300-ton fireproof coaling station designed by the Snow Construction Co. The structure is built of steel except the machinery house, which is concrete. Engines take coal on either side of the structure with the receiving hopper under the center of the building.

Fig. No. 5 represents a 150-ton steel coaling station

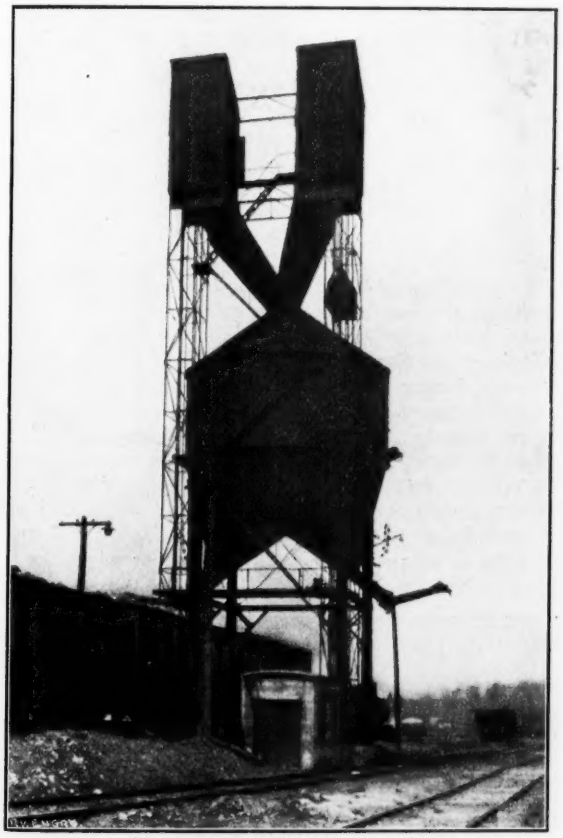


Fig. 5. Also Steel Coaling Station.

fireproof, also designed by the Snow Construction Company. All the coal in the storage bin moves when either spout is open, thus preventing spontaneous combustion. The low cost of construction makes this type of station very attractive in localities where lumber is scarce or expensive.

Illustration Fig. No. 6 shows a gasoline operated station on the Atchison, Topeka & Santa Fe. This is a design of the Lidgerwood Manufacturing Co. and serves its purpose very satisfactorily.

In designs for coaling stations the field is almost unlimited. Circumstances of course will govern as to what special design or type is to be chosen in any given case; but from the list of types in general which we present, a selection can readily be made. Assuming that the choice is the best, an economical handling of engine fuel will be the result. A railroad operated without this most essential feature at every point where it can be used to advantage is not working on lines of true efficiency.

ROADMASTERS' CONVENTION.

Program of the 33d Annual Convention of the Roadmasters and Maintenance of Way Association of America, Auditorium Hotel, Chicago, Ill., Sept. 7-10, 1915:

Tuesday, September 7—Convention called to order at 10 a. m. by President P. J. McAndrews.

Address of welcome on behalf of the City of Chicago by Hon. William Hale Thompson, Mayor of the City.

Addresses of welcome on behalf of the railroads by Mr. W. G. Bierd, President of the Chicago & Alton Railroad, and Mr. W. J. Towne, Assistant General Manager of the Chicago & Northwestern Railway.

Address of welcome on behalf of the Track Supply Association by President E. M. Fisher.

2 p. m. to 6 p. m. Business session. Reading of committee reports and general discussion.

7:30 to 10 p. m. Business session. Reading of committee reports and general discussion.

Wednesday, September 8—8:45 a. m. to 5 p. m. Members of the Roadmasters' Association, Ladies' Auxiliary and the Track Supply Association will meet at the C. & N. W. Terminal at 8:45 a. m. A special train will leave at 9 o'clock for an inspection of the various terminals en route to the Stock Yards.

Arriving at the yards, the party will be taken through the plants of Armour & Co., Swift & Co., and Libby, MeNeil & Libby. The Union Stock Yards Company will serve lunch at 1 p. m. The party will then visit the clearing yard at Stickney and return to the Northwestern Terminal by a different route, arriving there at 5 p. m. Autos will be waiting to take the party on a sightseeing trip of the city. This feature and the entertainment for the balance of the evening will be in charge of the Track Supply Association.

Thursday, September 9—9 a. m. to noon. Business session. Reading of committee reports and general discussion.

1:30 p. m. to 6 p. m. Business session. Election of officers. Selection of the next convention city. The time from 2:30 to 4 p. m. will be given to an inspection of the exhibits of the Track Supply Association.

Theatre party for the ladies by the Track Supply Association.

The fourth annual banquet given by the Track Supply Association in honor of the members and guests of the Roadmasters and Maintenance of Way Association of America. At the Auditorium Hotel. President Fisher has arranged for speakers of national prominence in railway matters to make addresses.

Friday, September 10—9 a. m. to noon. Business session. Reading of committee reports and general discussion.

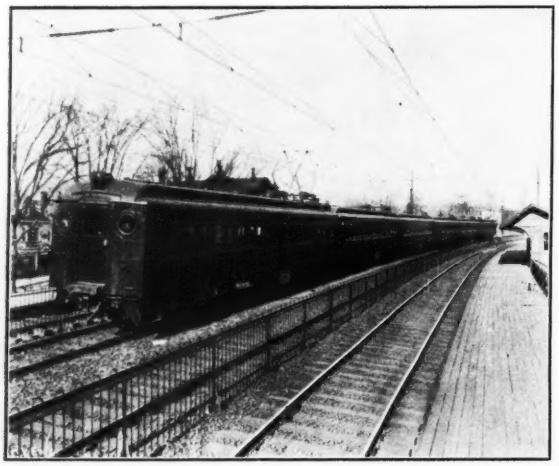
1:30 p. m. to 6 p. m. Business session. Reading of committee reports and general discussion.

COMPLETION OF TUNNELS OF BAGDAD RAILROAD.—The work of constructing the Bagdad Railroad, says the Consular Report, has continued despite the war. In the mountainous sections, which border the Cicilian Plain, the boring of several important tunnels has been finished. The completion of the longest of these tunnels was recently appropriately celebrated. It extends for 4,950 meters, or over 3 miles, through the Amanus Mountains. The work is in charge of German and Swiss engineers.

Electrification Features and the "Talking" Signal

The substitution of the electric current for steam power in operating electric locomotives for hauling passenger and freight trains has been taken up by the New York Central, the New York, New Haven & Hartford companies, and at last by the Pennsylvania Railroad. The New Haven has compared the expenses in train haulage by electric and by steam power from its Long Island terminus to Stamford, Conn., a distance of about 60 miles, and finds that the expense of service is a considerably less and the service more efficient than by using ordinary steam locomotives.

The Pennsylvania began to realize that the traffic was



Electric Train at Station.

becoming too heavy to be properly and efficiently hauled to and from the Broad Street Station in Philadelphia. The company faced a condition that admitted of two solutions, each of them costly. One, which did not seem at the time as either practicable or advisable, was to enlarge the station, and the other was the electrification of a part of the line.

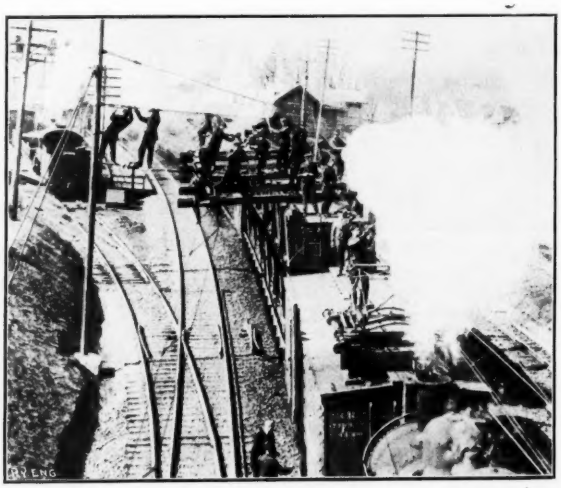
The engineers worked on both problems and made their reports. The electrification of the division on the main line was planned between Broad street and Paoli, which carried the bulk of the suburban traffic. The estimated cost was about $4,000,000. The company decided to electrify the Paoli division, and if this experience proved as successful and as economical and efficient as it was expected to be, the electrification of Chestnut Hill division and later the New York division would follow.

It has been proved by the studies made by the company's engineers and by other experts that the saving will be sufficient to pay the interest charges on the cost of installation. A series of experiments were carried out over a mile of track. This was done at the suggestion of the company's consulting engineers, Gibbs & Hill, who had a number of careful tests made to determine, not merely what was best for the immediate work to be undertaken in the matter of electrification, but what system would prove best for the larger and more comprehensive system of electrification which the company intends to adopt in the future.

The tests carried out showed that the single-phase alternating current system would likely prove more efficient than any other. This system of operation was consequently adopted, and the type of overhead construction for this system was decided on, together with the method of transmission, and this makes possible the use of any type of motor. While the new trains on the electrified lines will be drawn by motors on each car, the single-phase system also admits of the use of split-phase locomotives, or any of the types of single-phase motors, or for the use of the rectifier, which also is something of an experiment, and will be used here for the first time.

The method of construction of the overhead transmission is an entirely new idea. The series of miniature "wire bridges" are supported from wire cables, which in turn are held in place from steel tubular poles. These poles between West Philadelphia station and Broad street are replaced by a series of iron towers. On the experimental section a catenary bridge of lighter construction was planned, but this was abandoned for the present system of wire catenaries. A span wire of heavy cable is carried across the tracks between two tubular steel poles. These poles are placed at 300 ft. intervals. From this is suspended a single longitudinal catenary with a secondary messenger wire of copper, and a trolley or contact wire of bronze.

The messenger cable carries the current and distributes it through a secondary messenger wire and bronze hangers to the contact wire. These hangers are placed at 15-ft. intervals along the wire and are of varying length. They are longer near the cross catenaries and shortest halfway between the latter. The object in hanging the contact wire in this way is to give it greater flexibility and at the same time to conduct the power more evenly. The effect is that of a series of little suspension bridges. Small two-piece clips fasten the contact wire to the hangers, and between every second pair of clips a hanger from the catenary is attached to the upper wire. In the



Stringing "Catenary" with Steam Power.

scheme of electrification it was decided to purchase current, and a contract with the Philadelphia Electric Company has been made by which that concern furnishes current at 13,200 volts. This is admitted to a central

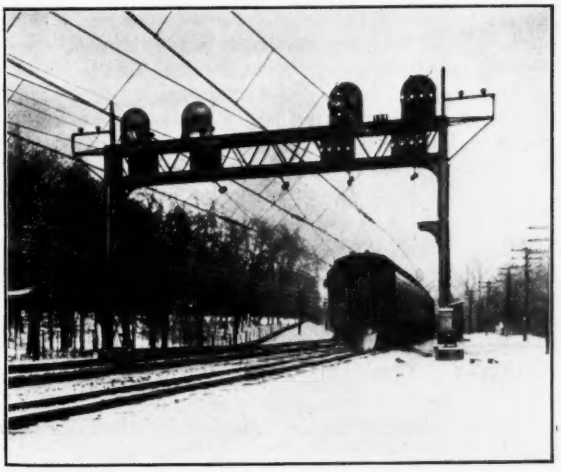
transformer station, and after being raised to 44,000 volts transmitted along the line. In turn, this voltage is reduced to 11,000 in transformer feeder stations.

One of the difficulties which has been obviated is the danger of storms breaking the wiring, especially when accompanied with wind and sleet. All wires have been placed underground, and consequently will remove a great deal of the inductive interference which is always more or less present in electrical lines. So far as the overhead construction itself is concerned, it is the belief of the engineers that it is so solidly built that it is not likely to be damaged under ordinary weather and other conditions.

About 100 of the regular standard steel coaches in use on the road have been equipped with the necessary motors. To each car has been attached two 225-horse-power, single-phase, commutator-type motors, both mounted on one truck. They are furnished with multiple unit control, so that the load of train does not fall upon the leading car. All of the motors on the train are in operation at the same time. Each car propells itself, but all are synchronously controlled by the motorman at the front of the train. As each of the cars on these suburban trains will carry its individual motor there will be no trailer cars, except when there may be one or two trailers added on a few of the routes having heavy traffic. The top rail of the pantograph, which is a substitute for the trolley system, presses against the contact wire and thus receives the current for the motor. The cars are similar to those used in the service of the Pennsylvania Terminal in New York, but while these cars have motors of 215-horse-power, the cars on the Paoli line will be equipped with motors of 225-horse-power.

An entirely novel signal system, differing in all respects from any before used in railroad service, has been placed in operation by the Pennsylvania Railroad from Overbrook to Bryn Mawr. The new signals are especially designed to promote safety, efficiency and economy. All moving parts are eliminated from the signal apparatus. This not only reduces to a minimum the chance of getting out of order, but is also expected to lessen the cost of installation and maintenance.

The feature of the new signals is the substitution for day and night use alike of brilliant white electric lights, showing sharply against a black background, instead of the ordinary moving arm of the semaphore, now used by



Signal System with Incandescent Lamps.

day, with the colored lights at night. All positions of the semaphore arms, horizontal, diagonal and vertical, are duplicated in the new signal by the rows of electric lights. Each signal has a sufficient number of rows of lights to be the equivalent of two semaphore arms. To make the lights clearly visible, even in the brightest sunlight, the voltage used in the daytime will be nearly quadruple that used at night. The lamps can easily be seen in the clearest sunshine for more than 4,000 ft. These signals in a way resemble the familiar "talking signs" seen so often on the street and used for advertising purposes. Each signal will protect a block of track 3,500 ft. in length. A train passing a signal will automatically set it at "stop." When the train reaches the next block the first signal will

These Men Are "Up in the Air," But Busy.

change to the "caution" position made by lighting another row of lamps. The third position of lights will show when two full blocks are clear and a fourth "position" appears when three or more blocks are unoccupied.

The engineer will always receive notice of a possible stop when his locomotive is near the next signal at least 7,000 ft. in advance, and will receive two cautionary signals before approaching the "stop" signal. The signals are the logical outcome of having electrical power in plenty on the line. They preserve a similar appearance for day and for night service. There is practically little or no variation in form all over the road, and thus become, as it were, "standard" to the men on the road. They are, as was said, like the "talking signs" of the street, but the track circuit modified or not by the presence or absence of a train in the block, takes the place of the "flasher" used in commercial and advertising signs.

SOUTHERN INTERLOCKING PLANT

A mechanical interlocking plant is being installed by Southern Railway where the Edisto River Lumber Company's railway crosses the line of the Charleston division at Embree near Branchville. This plant is so arranged that the signals will stand normally in the "clear" position for trains of Southern Railway and with the derails and the signals set against the trains of the lumber road. By installing this plant Southern Railway will eliminate the necessity for stopping its trains at Embree and will also provide additional safety.

Just as far as you see, know, and represent it, just so far your work is finished; as far as you fall short of it, your work is *un*finished, and as far as you substitute any other thing for it, your work is spoiled.—*Modern Painters.*

TRACK FOREMAN; EFFICIENCY EXPERT

By "Steve."

I want to call your attention to the fact that the track foreman is an efficiency expert. I wish to show this in his handling of railroad work. It may seem astounding, as these men occupy the lowliest position in railroading, yet upon their shoulders rest the heaviest responsibility of the railroad world. The safety of the traveling public.

They cannot select their help as the other departments do, or require applicants to give references as to previous service. The track-foreman must go out and seek his help, and train ignorant or inexperienced men. If the man selected is American, and is ambitious to become adept in the use of tools, he finds opportunities in other branches of the service with better pay.

Other departments when they go up against a "stone wall" look to the track-foreman for assistance. The car department, when they have a piece of shifted material on a car, which they may consider too heavy to handle, or if the work cannot be done in the estimated time allowed by the M. C. B. rules, they get a requisition for the track-foreman to use his gang on this work. This prevents the car department from lowering their standard of efficiency.

The station service calls upon the track-foreman to load or remove heavy machinery from cars when too cumbersome or objectionable to their inefficient men. I saw a warehouse gang of six men work for two and a half hours, trying to unload a large engine from a box car. They gave it up and called upon the track-foreman to remove it. He took four of his men and placed the engine on the platform inside twenty minutes. The track-foreman is the "court of last resort," for if he cannot remove the "mountain" the others have no faith that it can be moved. Some may say it is cheaper to have the track force to do the work, as their wages are small. It has been proved time and again that the other departments are clamoring for help from the track force, to hole when their standard of efficiency is in danger of being lowered.

When an annual inspection is due, the other departments are clamoring for help from the track forces, to help maintain their efficiency. A station agent received a medal for having the neatest and cleanest station on the division. The section foreman and his men spent two days scrubbing the windows, floors, walls and ceilings of the office, waiting rooms and toilets, and cleaned and trimmed up the station grounds; the station force which consisted of five men did nothing toward the preparation for the inspection, yet the man who did nothing but request the track force to do his work received a medal (on account of the track-foreman's efficiency). Had the inspecting officials quietly dropped into that office four days ahead of the time the station agent would have been harshly reprimanded for the filthy condition of his station and its surroundings, and his "tide of efficiency" would have been at a very low ebb.

A few months ago the press of the country was agog with the news of one of our California railway conductors receiving a bronze medal for being the most efficient man in his line of railroading. I have yet to hear of a track foreman receiving a medal for suggesting safety methods. I know of a number of foremen who have worked on that same railroad who never had a day's suspension entered against their records, but have from ten to sixty days' commendation to their credit, for alert service. I venture to say, the percentage of efficiency of trainmen is small, when compared to that of the track-foreman. For twenty months in succession I compared the lists of suspensions and commendations and the average for the twenty months, taking 100 per cent. as a basis, the records of the train and engine men showed 85 per cent. days' suspension against 15 per cent. days' commendations; while the track foremen averaged 22 per cent. days' suspension against 78 per cent. commendations.

Let us look at this from another angle; the engine and trainmen were held responsible for their own actions alone, while a track foremen was held responsible for his entire gang. Taking the entire track force of the division, section, extra and yard gangs and calling the average, seven men in each gang, which is very low; the ratio would be 7 to 1. The track foreman's liability is seven times greater than that of the enginemen and trainmen, while his chances of commendation were on a par with theirs. In one terminal yard alone, the track foreman's diary (or field book) showed that during July, August, September and October he averaged 10 per cent. attending to his own duties and 90 per cent. assisting the other departments to maintain their efficiency.

Where the block signals are in use there is a constant demand upon the track force; when the signal department have or anticipate a case of trouble they call for help, the track foreman responds and the efficiency of the signal department is maintained. As a rule signal men say that the mentality of the track foremen was too low to grasp the intricacies of signal maintenance; yet, the day has come when track foremen are maintaining signals. On one roadmaster's district on the Union Pacific over $30,000 was saved in one year and the standard of signal efficiency was raised on account of fewer signal failures under the track foremen than there were before they took charge of signal maintenance.

When wrecks occur the first question that arises is how to shift the responsibility to the shoulders of the track foreman. On investigation it is often found that 95 per cent. of the wrecks and derailments are traceable to defective material, poor workmanship and careless inspection in rolling storck and motive power, or to the inefficincy of train and engine men, while only 5 per cent. of the disasters are chargeable to the track foremen and to the material furnished.

When a wreck or a derailment takes place the track foreman's services are in demand by the train or wrecking crews. At a wreck the foreman's own work, that of restoring his track to safe condition, is only thought of as a "secondary consideration" that can be done while the wrecker is taking a derailed car to the nearest siding while the others are resting and waiting for the return of the wrecker. No one assists the track foreman to restore the track, but if he is not ready when the wrecker returns they remark on the foreman's inefficiency, yet 60 per cent. of the foreman's time was used in assisting these men in maintaining their efficiency.

On electric railroads, although the electrical department carries quite a maintenance force, much of the electrical maintenance falls to the lot of the track foreman, and where the third rail system is in use, the entire maintenance of the electric rail devolves upon the track foreman.

When the third rail system was first installed on these railroads, the maintenance of the rail was directly under the supervision of the electrical department; yet they constantly demanded help from the track force. The track foremen now have the sole supervision of the maintenance of the third rail, and although they have this added to their regular duties, they are maintaining

it, showing the highest efficiency, without any increase in the track gangs.

When the Storm Kings reigns, the foreman and his force are found day and night patroling the track; when disaster comes he toils without rest, often times without food, until the track is again safe for the passage of trains. During these strenuous times, officials will rush to the slide or washout; newspapers proclaiming that they are going there to take charge of the work. When on the job they are simply spectators and if the storm has not unabated these "fair-weather men" will remain in their private cars and request the roadmaster (a promoted track foreman) to make hourly progress reports to them. In the meanwhile the track foremen and their forces work straight on. When the road is open again the newspapers tell how quickly the slide was cleared due to the vigilance and expert handling of the work by the officials. The track foreman is the first on the job, and the last one to leave, and his judgment respected.

Summing up the whole matter, the track foreman is a man who stands squarely upon his own feet; day or night, fair weather or foul he is on the job, relying upon no one and helping others. Is it not true that here is an expert in railroading? Is he not an efficiency expert in the true sense of the word. His position in life calls for integrity, ability and clear understanding. Let me ask again, am I not right when I assert, that the track foreman is an efficiency expert?

CHEERFULNESS VERSUS GLOOM

The cheerful man is a jewel among his associates and cannot help but suggest contentment wherever he appears, in marked contrast to the fellow who is gloomy, or, as the expression now goes—*"the man with a grouch."*

No where is this more noticeable than in and about shops or manufactories where large numbers of men are engaged whose daily life and comfort depend a good deal upon their surroundings. It is therefore of the utmost importance that commodious quarters together with plenty of light and air be provided. This will aid, in a large degree, toward creating cheerful dispositions. In the past, much less regard than at present has been paid to shop comforts To-day, however, the railroad companies when they put up new shop buildings or add to the old ones are in the habit of devoting especial attention to these needs, and it is most excellent judgment to do this Without such consideration, work is apt to become a drudgery and no man can be expected to do his best who is obliged to toil, where proper facilities and ordinary comforts are lacking.

It is not surprising that we now and then run across *"a man with a grouch."* Yet we will find men who wear a pleasant countenance and exercise cheerful dispositions, even under the most trying circumstances and who are always ready and willing to perform their alloted task, no matter what their surroundings may be. Such men are cheerful by nature as a rule, but they can instill the same disposition in others not so born, and often do. It is possible therefore for most of us to cultivate the habit of cheerfulness if we be so willed.

Fortunately there is no such word as "grouch" in the English dictionary. It has been coined, and quite properly, to express a state of mind which was paramount in one of Napoleon Bonaparte's generals, named Grouchy, whose conduct at the famous battle of Waterloo was largely responsible for Napoleon's defeat. His was a case of discontent bolstered up by a consequent inefficiency. In other words, he had what we, in these days, call a *grouch,* for reasons which have never been fully explained. At any rate as a subordinate to Napoleon, he became in some way discontented and neglected his duty at a critical moment. Since the battle of Waterloo—fought more than a century ago, the fault-finding, discontented fellow is known as "Grouchy." The stigma, though severe, is well applied. The gloomy individual, who sees no sunshine, bright though it may be, who finds fault with his tools and his surroundings though they be ever so excellent and thereby creates discontentment among his fellow workmen, is the Grouchy of Napoleon's time. He is the man who brings defeat and disorder and we regret to say that here, there and everywhere, to-day, Grouchys are in evidence, and oftentimes without good reason.

Now that there are fewer reasons than ever for abandoning a cheerful disposition to become a Grouchy it is a wise idea to acquire the habit of being pleasant and willing. There will be more likelihood of a victory than a crushing defeat. As a result, the employe will do better work and both he and his employer will profit by it in general. Promotion is more easily within reach, while the gloom which envelops the grouchy man is like a fog which deceives the vision and means serious dangers ahead, until it is dispelled.

This lifting of gloom and substituting for it cheerfulness is a slight task which is bound to repay one a *thousand fold.* The tendency of the times is toward a season of unparalled prosperity. We can materially aid humanity in general to reach this goal by being cheerful in spite of conditions and annoyances which sometimes suggest gloom or a *"grouch."* The man with a *"grouch"* is assuredly not in the way of doing his best. When one fails to do his best he is liable to be classed as incompetent and, so listed, contributes to a failure instead of a success.

The discontented man who carries his *grouch* to the point of abusing the company which employs him, not only shows a disloyal spirit, but may spread a feeling of disloyalty throughout the shop where he works. He should never forget that loyalty to his company and his cause is the foundation upon which the successful operation of all the departments is based.

THE LUNDIE TIE-PLATE

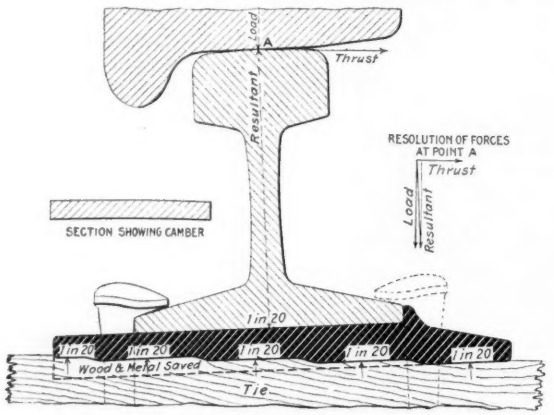
The tie-plate designed by Mr. John Lundie is based upon the assumption that the rail shall be inclined inward toward the flange of the wheel. This inclination is advocated in order to put the wear of a coned wheel where it should be, at or near the center of the rail, and not at one side, as is the case with the upright rail.

With that assumption in view the tie-plate has been designed so as to meet new requirements which arise from the support provided by a horizontal tie, and the base of an inclined rail. We have given, in another column in this issue, the claims of the advocates of inclined rail. We invite our readers to examine these claims, and to let us have their views for publication.

The rail being assumed as inclined, it is the function of the Lundie tie-plate to provide adequate and properly designed support. This tie-plate is flat on top, and upon its upper surface the flat base of the rail rests evenly and fairly. The underside of the tie-plate is sloped so as to be thicker at its outer edge, and this thickening slightly tilts up the outer part of the rail base, with reference to the horizontal tie, and in this way the required inclination of the rails is secured. To make the fit of rail base and tie-plate all the more sure a ridge is raised up, on

the outer side of the tie-plate, and against this ridge the outer edge of the rail base is laid. No lateral movement of the rail on the tie-plate can take place and the spikes pass through the plate and their heads grip the rail base in the usual way.

The tie-plate, however, does not rely exclusively upon the spikes to hold it in place. The under surface of the tie is made with a series of shallow steps, each being inclined 1 in 20, or at the same angle as the slope of the tread of an M. C. B. standard wheel. These steps, or parallel areas of slightly sloped surface, bed into the horizontal tie and secure a bearing not likely to slip, and thus the tie-plate relieves the spikes from side thrust



The Lundie Tier-Plate and Inclined Rail.

due to any tendency the rail may have to "roll out" or "spread."

The under surface of the tie-plate is, therefore, an approximation to the way a bridge foundation would be built on a sloping rock. It would not be notched or doweled into the sloping rock. The rock would be cut out in a series of steps like those of a stairway, and the foundation built upon the flat horizontal surfaces of the steps. In this way each step would carry a vertical load, with no wedging action or tendency to slip. It is said that a properly bedded tie-plate would hold even if no spikes had been driven.

The Lundie tie-plate, therefore, beds itself into the wooden tie, it permits the rail base to rest evenly on it, it provides a ridge against which the edge of the rail is placed, and it insures a tilt or inclination of rail, so as to bring the center of the railhead under the bearing portion of the wheel tread with advantage to wheel and rail.

The tie-plate has also a slight longitudinal camber, so that there is always a certain amount of "spring" between rail and tie-plate. This is believed to produce smooth riding, and, as it were, to form a minute but effective cushion which reduces the cumulative effect of slight shocks. The camber perhaps does its best work below a joint, where two rail ends come together. The tendency to "springiness" is there, but sufficient stiffness is retained not to develop any lost motion. The smooth riding of the cars is the result sought in this arrangement, and it is gained without shock, lost motion, or up and down play between rail ends.

The tie-plate is here put forward for the consideration of practical railroad men, as a device intended to secure good service, carry the wheel load on a more scientifically selected position, with the consequent reduction of flange and rail-head wear, and with the longer life of both.

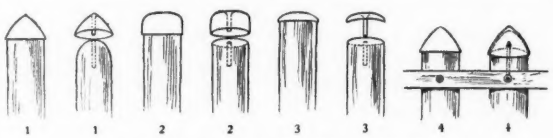
It aims not only to be good in itself, but, by its form, to tilt or incline the rail with a beneficial effect on the rail and also on the wheel. It may be used without requiring any change in existing conditions, and by its introduction it is believed to be capable of prolonging the life of worn wheels and old rails. Our readers will find elsewhere in this issue a more comprehensive statement of the claims set up and a presentation of the contention of those who favor the inclined rail. We invite discussion on the merits of this tie-plate, and also of the larger question of the advisability of introducing the inclined rail or of retaining its present upright position.

PILING IT ON

In the matter of piles used in railway work, especially sheet piling and places where the head of the pile is exposed, Mr. Oscar A. Logan of 261 Broadway, New York, believes that the conditions held in the future ought to be looked at now, and with thoughtful care. He believes that piling will become more and more expensive as time goes on, and that the piles at present in place can be made to last longer than they otherwise would, if a little care was bestowed on them now.

In order to retard, if not defeat, the ravages of time, he proposes to provide each pile with a suitable cap. The pile-cap to be, like that of a soldier, serviceable and adapted to the work in hand, if one may describe the passive resistance of a pile as "work in hand." A cap like that of No. 1 suits a rounded top pile and weighs about 50 lbs. No. 2 goes on a pile where the top is cut off horizontally. It weighs about 60 lbs. Cap No. 3 of 17 lbs. weight is designed to cover the heads of piles "bunched" close to one another, like the group which is usually found at the ends of the sheet piling rows on a railway ferry slip.

These caps are made of cast iron. Those like Nos. 1 and 2, have a 1-in. spindle in the center, 8 ins. long.



Caps of Various Shapes for Piles.

To apply this cap on piles in ferry racks he says bore the hole diagonally from the back of the pile down, to hold the girth which supports the ferry racks, so that no water can follow the bolt and cause the pile to decay. On No. 3 the spindle is ⅝ in. and 8 ins. long. It is possible to make these caps of pressed steel with separate spindles. The "big idea" in capping the piles at the top, is that here is the place where the wood being cut across the fiber, is most ready to take up moisture from the air, or swallow it down when a good shower of rain soaks the uncapped pile.

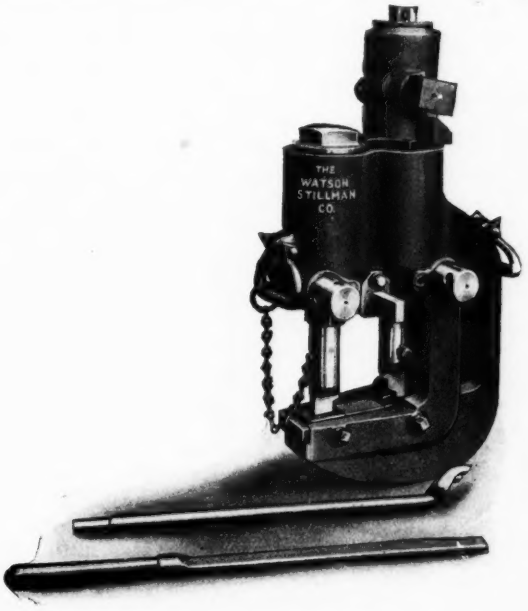
USE OF GRAPHITE BRUSHES

A rough and worn commutator will generally produce sparking and not only cause annoyance and low efficiency during operation, but eventually make an extended and expensive shut-down for necessary repairs. It has been found that graphite brushes are excellent for use upon commutators because they are free from grit and are self-lubricating. Many users of electric power machinery have adopted Dixon's Graphite Brushes and results with them have been highly successful.

NEW DUPLEX SPIKE SLOT PUNCH

The Watson-Stillman Company, Aldene, N. J., has brought out a new hydraulic punch for cutting out two spike slots in railroad or electric conductor rails at one setting. The advantages of this tool are that two holes can be punched at one operation on opposite sides of the rail in exact alignment, the saving in the time usually consumed in laying out centers and changing the machine from one side to the other of the rail. It will be seen by this arrangement that it makes an efficient tool for use by unskilled labor.

The action of the punch is as follows: By referring to the illustration it will be seen that one punch is attached to a chain, this punch is removed, the tool is then placed against the rail and the loose punch inserted in



Duplex Hydraulic Punch.

place, the punches are then run down to the rail by pinions, meshing into racks on the rams, and a few strokes of the pump lever completes the operation, the return or pull back is effected by the rack movement; the whole action taking less than two minutes and with but little effort.

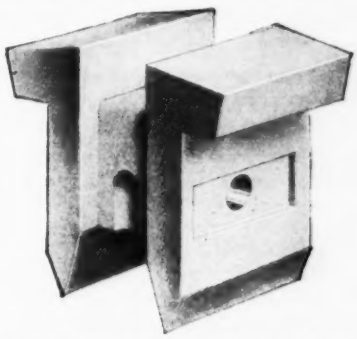
The punch is built in a compact manner and so designed that the greatest strength is obtained with the least weight, so that it may be easily and quickly handled when time is a factor. The working parts are readily accessible for cleaning and the punches and dies are removable for sharpening, renewal, etc.

NEW DESIGN IN PORCELAIN INSULATOR

The porcelain insulator to block, to which the wire-wound copper oxide plate, and the zinc plates of the Schoenmehl R. S. A. primary cell are secured, has been recently redesigned and improvements introduced.

The illustration shows two wedge-shaped edges extending along the lower side. These projections are between the plates of the battery, and this knifs edge design has been worked out to avoid bridging, and short circuiting, due to zinc oxide, floating in the oil seal on the top of the electrolyte, being carried down into the battery when the plates are introduced. The slanting sides of these separators set up diverging currents in the oil film which carry any solid matter to the sides of the insulator and prevent any undesirable accumulations.

The same result when lifting the plates from the battery is accomplished by the sloping shoulders of the top of the porcelain insulator which set up diverging cur-



Porcelain Insulator Block, Sloping Surfaces Divide Oil Seal.

rents in the oil and tend to free the lifted plates of any foreign matter or oil. Details and refinements of such a nature go to make a perfect battery that can be depended upon, day in and day out, to deliver its rated output and reduce the cost of maintenance.

BOOK REVIEW

PUBLIC UTILITIES, THEIR FAIR PRESENT VALUE AND RETURE. By Hammond V. Hayes, Ph.D., Consulting Engineer. 216 pages, cloth bound, $2.00 net.

This book is intended to supplement a previous study, made by the author, of the methods to be pursued in the valuation of the property of public utilities by entering into a discussion of the line of reasoning which must be followed by those whose duty it is to ascertain the fair present value of a property after an appraisal has been made and all necessary information has been obtained.

The chapters, numbering seven, treat respectively on some phase as follows: "Present Controversy," "Ascertainment of Fair Present Value," "Fair Rate of Return," "Replacement Cost," "Actual Original Cost," "Going Value," and "Depreciation." The author has treated the whole subject with breadth of conception and presents it agreeably. It is a work which should be helpful to engineers who have to do with this matter, which is, at present, engaging our attention.

It is a work which treats more of principals in general. As to details it might not be of especial use, should one expect to be guided in this direction. State and interstate commissions lay down the rules for action and to them an engineer must conform. As a work however on the fundamental principles involved in this important matter of the valuation of public utilities it is most excellent and a recommendation to read it will fall quite in line with our judgment of what the book in its pages intends to teach.

An idea of the intimate knowledge which railroad officials have of the cost of conducting the transportation service is afforded by the estimate made by fifty officials of the staff of the general manager of the Baltimore & Ohio Railroad, who estimated recently the expenses of the road for a month, taking into account every item down to the pounds of waste used in locomotive cleaning, and the figures showed that the estimate has been only $10,000 in excess of the actual cost.

Personal Items for Railroad Men

W. C. Basinber, Div. Eng. of the A. T. & S. F. R. R., Chanute, Kan., has been transferred to the same position at Marceline, Mo.

A. M. Harvey has been appointed signal supervisor of the Canadian Government Railways, with headquarters at Moncton, N. B.

Nathan L. Guilford has been recently appointed assistant industrial agent for the Baltimore and Ohio Railroad at Cincinnati, O.

Charles Edelman has been appointed signal supervisor of the Missouri Pacific Ry., at Ossawatomie, Kan., succeeding A. Dewey, transferred.

E. S. Mudge has been appointed assistant engineer in charge of valuation of the Atchison, Topeka & Santa Fe Ry., Western lines, with headquarters Amarillo, Tex.

L. Gilbert, Roadmaster of the Chicago Northwestern R. R., Eagle Grove, Iowa, has been transferred to Sioux City, Ia. His place at Eagle Grove to be taken by H. A. Halverson.

Thos. W. Blinn has recently been appointed to the newly created position of Assistant Engineer of Maintenance of Way of the Northern Ohio Traction & Light Co., at Akron, Ohio.

George M. O'Rourke has been appointed Assistant Engineer of the St. Louis Division of the Illinois Central R. R. with headquarters at Carbondale, Illinois, Vice Mr. William E. Russell, promoted.

J. E. Lloyd has been promoted to division engineer of the Baltimore and Ohio Railroad at Cleveland and has been succeeded by L. W. Strayer as assistant division engineer at Garrett, Ind. Mr. Strayer was transferred from Chillicothe.

R. A. Paterson, H. M. Buck and John B. Given, forming the United Railway Specialties Company of 30 Church Street, New York City, have been appointed representatives in the New England, Eastern and Southern States for Mudge & Company. Representation will cover Mudge Motor Cars, Mudge-Peerless Ventilators and Mudge-Slater removable box front end for locomotives.

E. E. Ball has been transferred from the position of Construction Engineer of the A. T. & S. F. at Winslow, Ariz., to Fresno, Cal., in the capacity of Div. Eng. Mr. W. L. Bradley, who held that position has been transferred to Needles, Cal., replacing W. H. Oliver, who has been transferred to San Bernardino, Cal. Mr. M. C. Bryan, Div. Eng. at this point has been transferred to Winslow, Ariz., as Div. Eng.

W. E. Folks, whose recent appointment as supervisor of the Cleveland, Cincinnati, Chicago and St. Louis Railway, with head-quarters at Riverside, Cincinnati, Ohio, succeeds Mr. J. L. Bradly, transferred to the White-Water Division. Previous to Mr. Folk's present appointment he was serving on the Chicago division and before that he held the position of Extra Gang Foreman on the west end of the St. Louis Division.

C. S. Klumpp, formerly Superintendent of Maintenance, has been appointed Superintendent of Operation of the Hudson and Manhattan R. R., in charge of the Transportation Department, as well as of the Way and Structures Department and Car Equipment Department, formerly under his supervision. Mr. Klumpp will be assisted in the respective departments by E. M. Blake, Asst. Supt. (Way and Structures Department) and P. V. See, Master Mechanic (Car Equipment Department).

S. A. Wanger, who was recently appointed storekeeper of the Chesapeake & Ohio Railway at Clifton Forge, Va., holds a record of more than 28 years of continual service with that road. In 1887 Mr. Wanger entered the service of the Chesapeake & Ohio Railway in the maintenance of way department, and served as foreman and supervisor of track until August, 1908, when he was appointed assistant storekeeper at Hinton, which position he has held until the announcement of his present change. Mr. Wanger succeeds Mr. G. W. Sutton, who has been transferred as storekeeper to Richmond, Va.

C. L. P. Russel, recently appointed supervisor of the Pennsylvania Railroad Company at Cresson, Pa., entered the service of the Pennsylvania Railroad in 1902 as rodman. From there he went to the Chesapeake & Ohio Railway, in the same capacity, and was promoted in 1903 to assistant resident engineer. For a short time in 1904 Mr. Russel prospected for coal in West Virginia, and re-entered the Pennsylvania Railroad service in 1904 as transit man and in that capacity was transferred from one department to another until in 1907 he was made assistant division engineer of the Conemough Division.. In 1909 he was appointed assistant supervisor and held this position until the change first announced above became effective.

Wade Neel, recently appointed supervisor of tracks of the Chicago Great Western R. R., with headquarters at Des Moines, Iowa, was born in Morgantown, Ky., in 1871, and entered the railroad service as section foreman on the Louisville and Nashville Railway in 1888. In 1892 he was appointed roadmaster of the Jacksonville Southeastern Railway and in 1898 became roadmaster of the Kansas City Belt Railway, now the Kansas City Terminal Railway. In 1909 he became assistant superintendent and held that office until it was abolished in 1911, when he was given the title of general roadmaster in full charge of maintenance of way and structures. This office he held until his appointment noted above, where he succeeds Mr. J. McManis, resigned.

S. P. Coffin, who was recently appointed supervisor of bridges and buildings of the Terminal Division of the Boston and Maine Railroad at Boston was born in 1883 and entered the Railroad service at Rodman, in the engineering department of the Boston and Maine Railroad on construction work in 1901. In 1903 he became instrument man and in 1907 assistant engineer. In 1911 he became resident engineer of construction of the Billerica Shops and in January 1915 general foreman of bridges and buildings for the Terminal Division, succeeding Mr. A. I. Gauthier, who was promoted to the position of supervisor of bridges and buildings at Concord, N. H. The position of general foreman being recently abolished, Mr. Coffin received the appointment first mentioned above.

Mr. W. H. Raleigh, recently made Roadmaster of the Dallas & Ft. Worth Divisions, relieves Mr. T. F. Sharp, who was recently made Resident Engineer of the Smithville District. Mr. Raleigh entered the railroad service with the M. K. & T. in 1906 in the Engineering

Department at Parsons, Kansas. In 1909 he assumed charge of the party on the Gulf Coast of Texas working about 8 months on a land survey, and then entered the service of the Engineering Department of the Southern Pacific at San Antonio. In 1911 he was appointed Foreman of the Eagle Pass branch of the Southern Pacific, consisting of 34 miles of track and the Eagle Pass yard. Since that time he has held various positions as Assistant Foreman of the steel gang, extra Gang Foreman and several other similar responsibilities.

W. G. SWARTZ, recently appointed Assistant Engineer of the Barre Division of the Grand Trunk Ry. System, with headquarters at Allendale, Ontario, entered the service of the Grand Trunk Railway in 1902 as rodman and instrument man on double track constructed and served in that capacity for three (3) years, after which he became assistant engineer on construction and maintenance of way for the Hamilton and Buffalo Railway. In 1908 he became engineer of bridges and buildings for the Grand Trunk Railway at Toronto, and in 1911 he was appointed resident engineer on construction for the Canadian Northern Ontario Railway with headquarters at Toronto, which he held until that work was completed. In his recent appointment, acting as assistant engineer, Mr. Swartz, who is an Ass'n. M. of C. C. of C. E., relieves Mr. J. Walker for active military service.

M. DONAHOE, recently appointed General Roadmaster of the Chicago and Alton R. R. with headquarters at Bloomington, Ill., entered the service with that road as a track laborer at Alton in 1888. In 1891 he was appointed Section Foreman at Godfrey and in 1892 was made Yard Foreman at Venice and served also as extra Gang Foreman In 1898 he became Assistant Roadmaster and a year later Supervisor at Alton. In 1910 he was appointed Roadmaster of the Southern Division at Bloomington and in 1911 General Supervisor of Roadway and Structures for the Northern and Southern Divisions. In 1912 he was made Division Roadmaster and Supervisor at Bloomington and in February, 1914, was made Division Roadmaster of the Southern Division, which position he held until his recent appointment as General Roadmaster of the entire system.

WILLIAM CHAPPELL DOWNING, lately appointed general superintendent of the Northwest System of the Pennsylvania lines west of Pittsburg, with headquarters at Pittsburg, was born August 21, 1865, at Richmond, Indiana, and entered the service as rodman in the Engineering Corps of the C., St. L. & P. R. R. at Richmond, Ind., in 1885. A year later he became acting assistant engineer, and in 1888 assistant engineer of the same division. Mr. Downing was appointed engineer of maintenance of way of the Richmond Division in 1891, and in 1895 was appointed in the same capacity on the Main Line division of the Terre Haute & Indianapolis (now the Vandalia). In 1901 he was appointed superintendent of the Peoria division of the Vandalia, and a year later returned to the Main Line division as superintendent, which position he held until 1912, when he was appointed superintendent of the Pittsburgh division of the Pittsburgh, Cincinnati, Chicago & St. Louis, with headquarters at Pittsburgh, Pa. In 1914 he was appointed general superintendent of the Central system of the Pennsylvania Lines West of Pittsburgh, with headquarters at Toledo, Ohio, from which position he is now promoted.

HENRY STEPHEN HAWLEY, president and director of the Railroad Supply Company of Chicago, died July 22, at his summer home at Saunderstown, R. I., at the age of 64 years.

Mr. Hawley was one of the foremost railroad builders of the world. He was a contractor on the Grand Trunk in the '70s, constructing the section of that road from Valparaiso, Ind., to Thornton, Ill. He purchased the Chicago and Southern Railroad at a master's sale, later selling it to the Grand Trunk. He was one of the promoters of the Chicago and Wisconsin route and in 1883 was elected president of the Chicago, Western and Minnesota Railroad Company.

When the Chicago Great Western Railroad was projected Mr. Hawley became general agent and purchased the greater part of the right of way. He was general agent of traffic for that road from 1883 to 1890, when he took the same position with the Chicago and Northern Pacific, holding that position for three years.

He was successively general agent and treasurer for receivers of the Chicago and Northern Pacific and the reorganized Northern Pacific Company, the Chicago Terminal Transfer Railroad, and traffic manager and assistant secretary of the Terminal Transfer Company. In 1902 he became president and director of the Railroad Supply Company, holding that position until his death.

RAILROAD NOTES.

Headquarters of the receivers of the Ga. & Fla. Ry. have been moved from New York to Augusta, Ga.

MT. AIRY & EASTERN RY. CO., David O. Sunderland, Supt., Mt. Airy, N. C., is starting a ten-mile extension.

LAKE ERIE, FRANKLIN & CLARION RY., Supt. L. S. Marshall, Clarion, Pa., have for sale one Vulcan steam shovel.

THE SOO LINE has taken over the Fairmount & Beblan Ry. (87 miles) to be operated as part of the Soo system.

DETROIT, BAY CITY & WESTERN R. R. of Bay City, Mich., are preparing to build 11 miles of new track south from Sandusky.

ALTOONA NORTHERN R. R. is at present reconstructing their road-bed, making the necessary changes involved, changing from 3-ft. gauge to standard gauge.

PRINCE EDWARD ISLAND RY. is making a diversion of line two miles in length from about two miles west of Albany Station to Carlton, a point on the Cape Travers branch.

Mr. M. H. McLeod, General Manager of the Canadian Northern Railway, has awarded a contract for the building of two 200-ton capacity automatic locomotive coaling plants for installation at Big Valley Alta. and at Kindersley, Sask. The Reborts & Schaefer Company of Chicago will do the work.

THE ARGENTINE AND GRAY'S PEAK RY., operating a 36-in. gauge mountain scenic railway; Superintendent Mr. Charles Sandstone, Silver Plume, Colo., are in the market for a number of light railway automobiles suitable for sight seeing purposes.

The same road have for sale a 45-ton Shay Locomotive, 100 tons of 40-lb. rail, and narrow gauge flat cars, coal cars and dump cars.

The property of the MINNEAPOLIS AND NORTHERN RY. has been taken over by lienholders under foreclosure proceedings and the name changed to Minneapolis, Anoka & Cuyuna Range. The line is now being electrified (overhead) and will be completed on or before Sept. 1st. The equipment to be used will be of the same type as that of the Twin City Rapid Transit Company, over whose rails the line will run from the present Terminal at 35th and Marshall Sts., N. E., into the heart of the City.